METROPOLITAN DISTRICT COMMISSION

THIRD ANNUAL REPORT

1922

11/24

Public Document No. 48

The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT COMMISSION

FOR THE YEAR 1922

Publication of this Document
approved by the
Commission on Administration and Finance

CONTENTS.

Report of the Metropolitan District Commission

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Commissioner has already presented to your Honorable Body an abstract of the account of the receipts, expenditures, disbursements and liabilities of the Metropolitan District Commission for the fiscal year ending on November 30, 1922, and now, in accordance with the provisions of section 100 of chapter 92 of the General Laws, presents a detailed statement of its doings for the calendar year ending on December 31, 1922.

THIRD ANNUAL REPORT

I. ORGANIZATION AND ADMINISTRATION

Commission, Officers and Employees

The term of office of Frank G. Hall expired on November 30, 1922, and he was reappointed for the term of five years next succeeding. The membership of the Commission has consequently remained as in the preceding year: James A. Bailey, Commissioner; Frank A. Bayrd, Frank G. Hall, William H. Squire and George B. Wason, Associate Commissioners. Frank G. Hall is Director of Parks, John R. Rablin, Director of Park Engineering, William E. Foss, Director of the Water Division, and Frederick D. Smith, Director of the Sewerage Division.

All directors of divisions serve without extra compensation, receiving only the salaries attached to the other positions which they hold.

George Lyman Rogers has continued as secretary, Alfred F. Bridgman as purchasing agent, and the following as chief engineers: of parks, John R. Rablin; of water, William E. Foss; of sewerage, Frederick D. Smith.

Mary V. Habberley has continued as bookkeeper and financial secretary of the Parks Division, and Alice G. Mason as bookkeeper and May L. Powers as financial secretary of the Water and Sewerage Divisions.

Under the provisions of chapter 406 of the Acts of 1922, Herbert W. West was appointed superintendent of police, and he has continued as superintendent of the Revere Beach Division and Charles River Division, Lower Basin; Elmer E. Bickford as superintendent of Nantasket Beach Division; Bartholomew J. Costello as superintendent of the Blue Hills Division; John L. Gilman as superintendent of Charles River Upper Division. Albert N. Habberley retired on account of ill health on August 1, 1922, and Spencer G. Hawkins was appointed as superintendent of Middlesex Fells Division. Mr. Habberley's service as superintendent for more than twenty-five years was notably intelligent and efficient, and the Middlesex Fells Reservation, of which he was in charge for fourteen years, was much improved by the exercise of his skill and taste.

The maximum number of employees during the year was 1,466, divided as follows: general offices, 31; parks, 869; water, 372, sewerage, 194.

In this tabulation of employees the police are included under parks, although considerable protection of the Water System is given by the metropolitan park police.

II. GENERAL FINANCIAL STATEMENT

Year ending November 30, 1922.

Expenditure for construction	$744,388 86
Expenditure for maintenance	2,695,674 28
Total expenditure	3,440,063 14
Unexpended balance maintenance appropriations	249,616 04
Serial bonds paid	180,056 25
Increase in sinking funds	2,003,677 15
Decrease in net debt	1,583,733 40

On November 30, 1922.

Net debt	$44,913,135 51

III. CONSTRUCTION

Chapter 529 of the Acts of 1922 authorized the construction of an additional Metropolitan Sewer for the North District, from Hill Street, Woburn, to the new Mystic Sewer in Winchester; also the construction of a new cast iron force main from the Quincy Pumping Station to the high-level sewer in Greenleaf Street, Quincy. Surveys have been made and plans completed for these additions, and a contract for the cast iron pipe made with the Warren Foundry and Pipe Company. Owing, however, to the late date when the appropriation became available and to the time thereafter necessarily consumed in making surveys and preparing plans for the work, the season was so far advanced it was not deemed wise to begin the work until another year. These extensions will be completed during the coming year.

The principal work of construction in the water system consisted of completing the installation of the new pumping engine at Chestnut Hill Pumping Station; the purchase of a new boiler for this station, and of a new boiler for the Spot Pond Station; the laying of five miles of new water mains for the Northern High Service district; and the erection of the new steel tank for the Arlington Reservoir.

In the Parks System, the easterly roadway of Blue Hills Parkway, from Mattapan Bridge to Brook Road, has been resurfaced with bituminous concrete pavement.

The easterly roadway of Cambridge Parkway, between Massachusetts Avenue and Cambridge Bridge, and the section between River Street and Western Avenue, have been resurfaced with bituminous macadam and the drainage in this parkway completed by the construction of fifty-six catch basins with drains and other incidental work. A public sanitary is under construction at Magazine Beach, and will be ready for use in the spring.

Under a special maintenance appropriation of $40,000, the Mystic Valley Parkway, from River Street to Medford Street, Arlington, and from High Street to Bacon Street, Medford and Winchester, has been resurfaced, as well as a section from Medford Street to Mystic Street, Arlington.

Under a special appropriation for the purpose, two shelters have been constructed at Nahant Beach Parkway. These shelters provide for a division of the shelters into compartments with glass partitions, so as to give shelter from whatever direction storms may come.

A contract has been awarded for the construction of the Neponset Bridge, and work is now in progress.

The construction of West Roxbury Parkway, from Centre Street to Weld Street, will be completed in the spring.

The construction of Winthrop Parkway was nearly completed in the fall, but work has been suspended during the winter months. The work will be finished at the beginning of the summer season.

Further work has been done in improving the grounds around Bunker Hill Monument by grading and loaming the banks and grass areas and repairing and repainting fences.

The garage and sanitary building near the Riverside headquarters has been completed and a new refreshment building constructed on the southerly side of Commonwealth Avenue, opposite the Riverside headquarters. Two new boat landings have been constructed, one at the refreshment building and one at the sanitary building.

At Charles River Speedway, the old wooden seats near the finish line have been replaced by bleachers of reinforced concrete.

At Nantasket Beach Reservation, a brick garage and storehouse was completed in June, and a men's sanitary building, to be located south of the road leading to the wharf, has been begun, and the work is now in progress.

At Quincy Shore, work of furnishing filling material for repairs to slopes to the beach and to provide for future widening has been done under contract by hydraulic dredging in the bay.

IV. EMERGENCY TREE WORK, MIDDLESEX FELLS

In the last annual report, attention was called to the damage done to trees in Middlesex Fells Reservation by the destructive storm of rain, sleet and snow in the last days of November, 1921, and the cost of clearing the reservation of broken branches and stumps of ruined trees was estimated at $50,000, not including a larger sum needed to cut the broken tops and limbs and perform the necessary tree surgery.

By chapter 13 of the Acts of 1922, approved February 3, 1922, the Legislature created a special commission, to serve without pay, consisting of the Commissioner of the Metropolitan District Commission, the Commissioner of Conservation, the Commissioner of Public Welfare, the State Commander of the American Legion and a person designated by the Governor, who should be the Chairman of the Massachusetts Committee to Promote Work, for the purpose of clearing the forests of the Metropolitan Parks of fallen trees and broken limbs and branches. The Special Commission was authorized to employ such persons as might be necessary for the purpose and to fix their compensation, and it was provided that the work should be done under the immediate supervision of the Metropolitan District Commission. The act appropriated $50,000 for the work, $25,000 of which was to be paid from the ordinary revenue of the Commonwealth and $25,000 from the Metropolitan Parks Maintenance Fund. John W. Hallowell, Esq., was the person designated by the Governor to serve on the Commission. This Commission organized immediately after the passage of the act and perfected plans for carrying on the work. It was decided to employ World War veterans through the agency of the State Commander of the American Legion from applicants listed at his office at the State House, and others than veterans through the agency of the Department of Labor and Industries from applicants listed at the State Employment Office in Boston.

On Monday, February 6, three days after the passage of this act, the work of clearing the Middlesex Fells of fallen trees and broken limbs and branches was started under the general supervision of Captain Herbert W. West. Two hundred men were, on that day, organized into eight gangs, each being under the foremanship of an officer of the Metropolitan District Police, thus saving the expense of employing special foremen for the purpose. On February 13, two hundred additional men were assigned to Middlesex Fells, and 100 men were put to work in Charles River Upper Division at Riverside. Two additional gangs were organized in the Fells, and three in Charles River Upper Division. By Chapter 232 of the Acts of 1922, approved March 31, 1922, an additional sum of $50,000 was appropriated for the work. The men worked on the whole efficiently, and despite storms of snow and rain, and the fact that many of them were poorly clad and inexperienced in out-of-door work, good progress was made. On March 31, the work in Charles River Upper Division was completed, and on April 7 the work in Middlesex Fells, and all men were discharged.

During the period from February 6 to April 7, work was carried on during 46

days, and entirely suspended on account of snow storms for 7 days. The total number of men employed was 1,105, and the largest number employed in any one day was 515. During the entire period of the work, 258 men were dropped from the rolls in order to furnish employment to a similar number of new men. 16,551½ days' work were furnished those out of employment under these appropriations. Approximately 1,800 acres were cleared in Middlesex Fells Reservation, and 72 acres in Charles River Upper Division, and a quantity of wood, estimated at about 600 cords, was piled up at various places scattered through the reservations. The Metropolitan District Commission furnished all tools and supplies used in the work; also all foremen and superintendents, so that the entire amount expended under the two special appropriations was paid for wages of ordinary laborers at the rate of $3.25 per day.

From careful inspection of the territory covered by the work, the results achieved surpass what one might reasonably have expected. The areas which have been cleared have entirely changed in their appearance. The entire work was done more rapidly and at less expense than anyone believed possible when the work was started. For these satisfactory results, great credit is due to Captain Herbert W. West, who took entire charge of the work, supervised it carefully and inspired the foremen under him to obtain from the men under them a reasonable return in work for the wages which they received.

The total expenditure from the two appropriations, exclusive of claims under the Workmen's Compensation law, was $53,794.25.

V. CHARLES RIVER BRIDGES

In the report of last year, attention was called to the fact that chapter 497 of the Acts of 1921, authorizing the Commission to construct new bridges without draws in place of the Arsenal Street, Western Avenue, River Street and Cottage Farm Bridges over the Charles River, was defective in respect to conferring authority to construct the three first-mentioned bridges because it did not comply with an Act of Congress of 1911, which required that, in any act authorizing the reconstruction without draws of these bridges, the Legislature of Massachusetts should make provision for payment of compensation to the owners or lessees of property above any of the bridges for damages by reason of interference with the access by water to said property due to the construction of bridges without draws, and that these damages should be determined by commissioners appointed by the Supreme Judicial Court of Massachusetts. While this defect in the bridge act of 1921 did not invalidate the authority given to reconstruct the Cottage Farm Bridge, it was noted in the report of last year that an advisory committee of four technical men of high standing, who had studied the problems involved in the reconstruction of all these bridges, had recommended that the Cottage Farm Bridge be replaced by a new bridge at what is known as the Magazine Street site, and that one bridge be constructed in place of the two bridges at Western Avenue and River Street; that these recommendations were approved by the Metropolitan District Commission and the officials of the cities interested; and that legislation would be sought in 1922 to harmonize the act of 1921 with the federal law and to carry out the recommendations of the advisory committee. In the following session of the Legislature, a bill (Senate No. 306 of 1922), on petition of Charles W. Spencer, was introduced, which contained provisions in conformity with the federal law and which also gave the Commission authority, if it deemed public convenience and necessity would be better served, to construct a bridge on the Magazine Street site in place of the Cottage Farm location, and also to substitute a single bridge for the Western Avenue and River Street bridges. After full public hearings, this bill was favorably reported by the Metropolitan Affairs Committee and passed the Senate. The bill failed of passage, however, in the House. The result was that, at the end of the session, the Commission was still left without authority to reconstruct any of the bridges covered by the act of 1921, except the Cottage Farm Bridge, and that only at or near its original loca-

tion. While the Commission still felt that the Magazine Street site was the logical and best location for a new bridge in place of the Cottage Farm Bridge, it, nevertheless, accepted the refusal of the Legislature to authorize a new location as final, and at once took the preliminary steps for the reconstruction of the Cottage Farm Bridge at its present site. It engaged the services of Haven and Hoyt, architects, approved one of the several designs submitted by them, and instructed the Park Engineering Department to proceed in the preparation of detailed plans and specifications for bids on a contract. While this work was proceeding as expeditiously as possible, it was learned that the President had signed a new Act of Congress, which, in effect, required that any law of Massachusetts which authorized the reconstruction of Cottage Farm Bridge without a draw should contain provisions in respect to damages and the method of recovering the same similar to those required in the Federal Act of 1911 in regard to the reconstruction of the three upper bridges. This new Congressional Act interposed the same legal obstacle in the way of reconstructing the Cottage Farm Bridge that had held up the construction of the Arsenal Street, Western Avenue and River Street bridges, and seemed to necessitate the suspension of any further work on the construction plans of the Cottage Farm Bridge until the legislation of Massachusetts should be brought into consonance with the federal legislation, or Congress should have repealed the requirement of such provisions for damages in the Massachusetts law. A bill to do this will be introduced in the coming session of the legislature, containing a provision that the location of the bridge to replace the Cottage Farm Bridge and the substitution of one bridge for two of the upper bridges may be determined by a commission.

VI. METROPOLITAN DISTRICT POLICE

A very important phase of the work of the Commission is the policing of the reservations and parkways under its control. The reservations have a total area of over fourteen square miles, an area probably equaled by few great cities. There are also over 80 miles of roads in the parkways and reservations open to automobile travel, and 13 miles of seashore and over 61 miles of river banks to be patrolled. Unlike the police territory of a city, the parks are distributed throughout the cities and towns of the Metropolitan Parks District in detached reservations, so that the work of policing cannot be facilitated by the ready shifting of officers and the overlapping of routes possible in a compact city with contiguous police divisions. This large area, with its many miles of roads, much of which is in close contact with thickly settled parts of the district, and parts of which are, at particular seasons, daily frequented by crowds greater in number than the population of a good sized city, is policed by a force of 165 permanent officers, including superior officers and 1 police woman, supplemented during six months of summer and fall by about 23 call officers. During the past year a total of 2,612 arrests or criminal complaints were made by the force. While this is a decrease of 206 over the previous year, an analysis of the offences discloses two facts which may have no relation to each other, but which individually are at least not reassuring. First, there were 560 arrests for drunkenness, an increase of 19 per cent. over the previous year, which in turn showed an abnormal increase of more than double those of 1920. Secondly, the offences against decency and chastity jumped from 32 in 1921 to 139 in 1922.

Great credit is due to Superintendent of Police Herbert W. West for the satisfactory performance of the police work of the magnitude above indicated with a comparatively small force. Mr. West was appointed Superintendent June 12, 1922, under authority given the Commission by Chapter 406 of the Acts of the year 1922. With a comprehensive knowledge of the details of the system gained in about 27 years of service, he combines rare executive ability, a keen judgment of men and character, courtesy and a personality which inspires respect and confidence.

VII. RAINFALL AND CONSUMPTION OF WATER

The rainfall on the water sheds of the metropolitan system for the year was considerably above normal. The Wachusett Reservoir filled early in April, and the elevation of the water continued above the designed high water line substantially the entire time from April 8 to September 22, 1922, which is the longest period during which the water has remained above high water mark since the reservoir was constructed. Late in October it seemed necessary to begin to waste water through the turbines in order to provide storage for the large yields which are to be expected in the spring. The wasting was continued until December 9, when the water level was 5.63 feet below high water mark. During the year no water was drawn for consumption from the Southern-Sudbury reservoirs or Lake Cochituate.

The per capita consumption of water was again reduced for the year to an average daily rate of 94 gallons. There was no special campaign to prevent waste, but the season was favorable to a lowered rate of consumption.

The effect of metering in preventing the waste of water is shown clearly by the fact that the total amount of water supplied to the district in recent years is approximately equal to the amount supplied fourteen years ago to a population several hundred thousand less than the present population.

The amounts supplied in million gallons for two years at the beginning and two years at the end of the fifteen-year period are as follows: —

1908	45,911	1921	42,853
1909	43,478	1922	43,532

VIII. SPECIAL INVESTIGATIONS

In accordance with the provisions of chapter 35 of the Resolves of 1922, the department of public works and metropolitan district commission, sitting jointly, investigated and reported on the expediency and cost of constructing the Old Colony Boulevard and other highway and parkway extensions of and additions to present routes; also alternative or additional routes to facilitate public travel from Boston and Quincy to points on the south shore and cape. The report is printed as House Document 1131 of 1923.

In accordance with the provisions of Chapter 51 of the Resolves of 1922, a special commission, consisting of the commissioner of public works and the commissioner of the metropolitan district commission, after careful investigation, selected a route for a parkway and traffic road from Boston to the Middlesex Fells Parkway via Wellington Bridge, and prepared plans for and suggested the method of financing the construction of the same. The report is printed as House Document 1104 of 1923.

IX. OTHER REPORTS

The reports of the Directors of Parks, Park Engineering, Water, and Sewerage, with tables, statistics and financial statements, are herewith presented.

Respectfully submitted,

JAMES A. BAILEY,
Metropolitan District Commissioner.

Boston, February 26, 1923.

REPORT OF THE DIRECTOR OF PARKS

Hon. James A. Bailey, *Commissioner, Metropolitan District Commission.*

Dear Sir: — I submit herewith my second annual report as Director of Parks of the Metropolitan District Commission.

I pointed out in my report last year that the principal problem of maintenance of the Park System is how best to furnish the facilities for, and promote interest in, healthy, outdoor enjoyment, that exercise and recreation which is the main purpose of the park system. In this report I will summarize briefly what has been done for this purpose in the past year, and some few of the many things which may still be done to increase the park facilities.

Middlesex Fells

An automobile road is very much needed from the end of Mystic Valley Parkway, in Winchester, easterly through Middlesex Fells Reservation to connect with Forest Street at Spot Pond.

The animal collection at the headquarters ought also to be improved by new stock and specimens. Since better parking facilities have been provided here, the number of people visiting this collection has increased, whereas very little money has been spent on keeping up the animal and bird collection and making this point correspondingly attractive.

On August 1, 1922, Captain Albert N. Habberley, who had been Superintendent of Middlesex Fells Division since April 1, 1908, was retired on account of ill health, and the division was put in charge of Captain Spencer G. Hawkins, who quickly acquired an intelligent grasp of the problems of superintendence and who has been performing excellent service.

The bathing conditions at Mystic Lake have been greatly improved by employing a lifeguard and special police officer there, to the satisfaction of the bathing public and those living in the neighborhood.

The special appropriations for the unemployed were well spent in repairing the damages to the trees in the reservation by the ice storm of November 1921. The work was done chiefly under the direction of our police officers.

Charles River Basin

It is encouraging to note that apparently larger numbers have used the public motor passenger boats for trips on the Basin this year than before. When the remaining old bridges over the Basin have been replaced by new and attractive structures, with navigation for pleasure boats and racing shells improved by some better alignment of arches, there is no reason why the Basin should not become one of the most popular water parks in the world.

Skating has been very much enjoyed, the ice having been kept free from snow with tractors and scrapers as far as feasible with the funds available. The portable house at Dartmouth Street for the use of skaters is now lighted by electricity and heated, and adds considerably to the comfort and convenience of skaters.

The old police motor boat used in patrolling the river has been in use over twelve years and has become too slow and otherwise unsuitable for patrolling purposes. A new one with more speed and better adapted in every way will be put in commission the coming spring.

On the Cambridge side of the Basin, considerable work has been done on the roads, walks and gutters, and a new sanitary building is now under construction at Magazine Beach and will be ready for use in the spring. Magazine Beach Bath House was patronized this season by 15,718 people, and the receipts exceeded the expenditures by almost $400.00.

Bunker Hill

The monument grounds have been put in fairly good condition; fences repaired and painted; and the banks and grass plots kept in condition. It is interesting to note that 30,914 persons ascended the monument during the year.

Revere Beach Division

Owing to the open winter of 1921–1922, considerable damage was done to the roads in Revere Beach Division, particularly on Revere Beach Parkway.

The bath house at Revere Beach was not patronized so much this year as the previous year, owing to the variety of the temperature and weather during the summer. The total number of bathers was 121,575, and the gross receipts $27,782.65.

The Commonwealth owns considerably over an acre of land at the corner of Revere Street and Revere Beach Reservation. It would be possible to develop this into a parking ground for automobiles at comparatively small expense. It is recommended that this matter be looked into, with a possibility of working toward this end with the ordinary forces of the division during the coming season.

Charles River Upper Division

At the Speedway, the track was never in better condition. The new concrete grandstand substituted for the old wooden one is a distinct and permanent improvement. The Metropolitan Driving Club held a very successful horse show in June, and the Junior League meeting was held in July. Both events were great successes and well attended.

A much-needed sanitary building has been constructed at Echo Bridge, Hemlock Gorge Reservation.

A new refreshment stand has been built at Riverside Path, Weston Bridge, and new floats at the same point and at the Riverside headquarters, where the new sanitary station and garage are located. These improvements have been much appreciated.

The road to the Riverside Recreation Grounds has been improved and now offers easy access for automobiles.

More tennis courts are needed at Riverside Recreation Grounds. 5,855 players used these courts this year. Tennis has now become one of the leading sports of the country, and it is recognized in tennis circles that public tennis courts, particularly in the west, have been a most important factor in popularizing the sport and in developing championship timber. A movement is now on foot by the National Lawn Tennis Association to stimulate interest in, and the extended use of, public courts, particularly in the east. There is an unusual opportunity for developing a public tennis centre at Riverside Recreation Grounds, which would be in line with this movement. In this connection, it may also be added that there is a considerable parcel of land on the northerly side of Cambridge Parkway, at the corner of River Street, on which some work has been done in preparing a few tennis courts. It is believed that public tennis courts at this point would also be very much used.

Nantasket Beach Division

The valuable parcel of land owned by the Commonwealth at the corner of Wharf Avenue, so-called, and County Road still remains idle. A new sanitary building for men is being erected on a part of the lot near the railroad location,

and it would seem wise to make use of the building foundation now on the remainder of the lot for the erection of a suitable shelter for use of the public in case of sudden showers and while waiting for public conveyances; and also for living quarters for the superintendent, who is required, for purposes of administration, to live on or near the reservation. The Commission now hires a cottage for him in the vicinity of the reservation, but this is not so convenient for administration purposes as living quarters would be at this central corner of the reservation. The amount now paid for rent for a house for the superintendent would go far toward paying the interest on any money invested in the construction of quarters to be owned by the Commonwealth.

A sea wall has been constructed, extending northerly from the neighborhood of the merry-go-round, which will furnish a much needed dumping ground for ashes and for broken glass and débris picked up on the beach. In this way, the beach itself will be kept in better shape, and by the gradual filling in back of the wall a considerable additional area of useful land between County Road and the beach will be created.

The hotel has been painted and relet to the previous lessee at a greatly increased rental for a term of three years.

Police

The new style police uniforms greatly improve the appearance of the officers. Few people realize the work required to train the police to their present standard of efficiency. The force is given military drill once a week for practically two months during the winter. General proficiency in this feature, as well as in the general duties, is aided by the fact that many members of the department have seen service in the army. The greatest credit for the result, however, should be given to the experience, sound judgment, tact and self-sacrificing labors of Superintendent of Police Herbert W. West.

The handling of automobile traffic is becoming more difficult each year, due in part to the increased number of automobiles and in part to the illegal sale of intoxicating liquors, but the force has nevertheless been kept down so far to a total of 165 patrolmen and officers by an enlarged use of automobiles and motorcycles in patrolling.

Many bad turns and dangerous points in the roads have been marked by directing or lighted signs, and I hope that more will be placed in other dangerous spots to ensure safety.

I strongly recommend the passage of an act enabling the Commission to pay the hospital, medical and other expenses of police officers injured in the performance of their duty. These expenses had always been paid prior to this year. At that time, however, an opinion was rendered the Auditor by the Attorney-General that the law did not authorize the payment of such bills. The feeling of an officer that, if he is injured in the performance of his duties, he may be put to great personal expense certainly does not act as an incentive to him to take any more chances than absolutely necessary, and obviously cannot operate as a spur to the performance of duty in an emergency. It is earnestly hoped that the bill authorizing the payment of these medical and hospital expenses will become a law.

Most excellent work has been done by the women police officers, and I feel that their number should be increased.

General

The bridle paths in Blue Hills and Middlesex Fells Reservations are being used more than ever. This form of recreation should be encouraged as much as possible by improvement of existing paths. A new bridle path has been constructed in West Roxbury Parkway, from Anawan Avenue to Washington Street. I recommend a bridle path be laid out from the Weld Farm to the West Roxbury Parkway.

The water tower on Bellevue Hill, West Roxbury Parkway, was opened to the public from June 17 to October 22, and nearly 2,400 persons altogether climbed the tower to enjoy the wonderful view from this point.

Many old fences have been removed along the parkways and replaced by new fences having cement posts with woodwork painted grey, which seems a more practical color.

Gypsy moths are well under control in the reservations.

In Blue Hills, the work of cutting out dead or dying chestnut trees is still going on under contract, and will be completed about October 1, 1923. Some 4,000 cords of wood have been sold this year in Blue Hills Reservation, and the ground over which it was cut cleared of brush.

The policy of planting trees and shrubs of different kinds in the reservations has been continued, and we hope to do still greater work in this line.

At Lynn Beach, two shelters authorized by the legislature of this year have been built and are a great source of comfort and convenience to the public. Others are needed in the same vicinity, as well as at Revere and other beaches. The extension of the drive of West Roxbury Parkway from Weld Farm to Hammond Street at the earliest opportunity is recommended. This would make practically a continuous park road through the Boston park system to Blue Hills and the country beyond. I strongly recommend, also, the construction of a road along the southerly boundary of Blue Hills Reservation, to connect on the west with an improved highway from Dedham and beyond and on the east with Braintree and the south shore. The congestion of automobile travel on the narrow driveway of Quincy Shore Reservation and the inadequacy of parking opportunities have created a rather serious situation, both from the standpoint of the majority of the people desiring to use the beach for bathing and recreation purposes and from that of the automobilists. It seems inevitable that necessity will compel the widening of this driveway and a provision of ample parking spaces in the very near future. The driveway of Furnace Brook Parkway, from Newport Avenue to Hancock Street, has been completed and opened to travel. The driveway of Furnace Brook Parkway should be extended under the New York, New Haven and Hartford Railroad easterly to Hancock Street, a distance of about 800 feet.

The band concerts have been very well attended. At Nantasket, a large number thoroughly enjoyed the good music. I think it would be wise to increase the number at that reservation. By our system of obtaining bids, we were able to furnish all music required and turn back to the State Treasury over $10,000 this year.

Thus far, there has been an unusual amount of snow, making the problem of keeping the roads open for travel unusually difficult. Nevertheless, the roads have been kept in remarkably good condition in all the divisions, in very favorable contrast with the roads of other municipalities in the vicinity.

New office accommodations for the general office are greatly needed. The two buildings at 1 and 3 Ashburton Place now used for that purpose were constructed as dwelling houses, and are understood to be more than one hundred years old. The annual repairs on the building are necessarily expensive, and the cost of heating and janitor service is large. The floor space, at the best, is inadequate and is so cut up by partitions and stairways as to make it impossible to use the limited floor space to the best advantage. There are no elevators, so that those of the public visiting the engineering department of the Parks Division are obliged to walk three flights of stairs. The whole arrangement is awkward and wasteful of time and energy. Above all, the building is not of fireproof construction and houses documents and plans, the loss of which would be irreparable. I cannot too strongly urge the provision of new fireproof headquarters at the earliest opportunity.

Respectfully submitted,

FRANK G. HALL,
Director of Parks.

December 31, 1922.

REPORT OF THE DIRECTOR OF PARK ENGINEERING

January 2, 1923.

Hon. James A. Bailey, *Commissioner, Metropolitan District Commission.*

Sir: — I submit herewith report of the work done under the supervision and direction of the Engineering Department of the Park Division, for the calendar year ending December 31, 1922.

The engineering force has consisted of the Chief Engineer, one principal assistant engineer, one permanent and one temporary designing engineer and draftsman, four permanent assistant engineers in charge of parties on surveys and construction work, six permanent and five temporary engineering assistants of the grades of transitmen and rodmen, and two permanent and one temporary inspectors. The total force has been increased over that of last year by about the number of temporary employees, but the increase in the amount of work handled has been greater in proportion.

Beside the usual contracts for construction of parkways and incidental structures, two large bridge projects have been in progress, and ten buildings of varying sizes and for various purposes, such as sanitary convenience stations, garages and storage sheds, refectory and bath house extension, have been designed and constructed by the department and in co-operation with the architects. Also, the work of reconstruction and resurfacing of roadways which in the past, has generally been done by the forces of the various divisions, has this year been almost entirely done by contract, requiring the preparation of specifications and contracts and more careful supervision and inspection by the Engineering Department. There has been the usual amount of work for the investigation and reports on restrictions and on requests for permits, the issue of permits and the supervision of works done thereunder; also the care, repair and operation of bridges, locks, etc.

The cost of conducting the department has been as follows: —

Engineering:		
Construction:		
Services	$18,358 75	
Expenses	2,067 02	
		$20,425 77
Maintenance:		
Services	$21,653 49	
Expenses	2,705 30	
		24,358 79
Total		$44,784 56

The following is a detailed list of the work done under the direction of the Engineering Department.

Parkways.

Blue Hills Parkway. — The easterly roadway from Mattapan Bridge to Brook Road has been resurfaced with a bituminous concrete pavement. The section is about 1,670 feet in length and 36 feet in width, making a total of 6,855 square yards. Bids were received on August 31, 1922 and the contract was awarded to Warren Bros. Co., lowest bidders. Work was begun September 13, 1922 and was completed on October 31, 1922 at a total cost of $12,449.84.

The roadway surfacing of this section of the parkway which is replaced, was built of water bound macadam in 1899, and was given a surface treatment of asphaltic oil in 1910 and additional light treatments from time to time when necessary. This has been the only work necessary to maintain this roadway in excellent condition under the heavy motor traffic until the past two years, when it has gradually failed, requiring the resurfacing as noted above.

Cambridge Parkway. — Portions of the easterly roadway between Massachusetts Avenue and Cambridge Bridge, and the whole area of the section between River Street and Western Avenue have been resurfaced with bituminous macadam. Bids were received on July 6, 1922 and contract was awarded to the lowest bidder, Rowe Contracting Company. Work was begun July 20, 1922 and was completed October 18, 1922. A total of 13,178 square yards have been built at a cost of $15,454.85.

On August 3, 1922 bids were received for the completion of the drainage system in Cambridge Parkway. This work consisted of construction of 56 catch basins, the drains therefrom and other incidental work. The contract was awarded to the lowest bidder, the Canton Engineering Company. The work was begun August 11, 1922 and was completed September 30, 1922. Total cost of contract was $13,001.67.

Plans and specifications have been prepared by Desmond and Lord, architects for a sanitary and public convenience station at Magazine Beach, Cambridge Parkway. Bids were received for the work on August 31, 1922, and the contract was awarded to the lowest bidder, Archdeacon & Sullivan. Work was begun October 11, 1922 and is now in progress, and it is expected to be ready for use in the spring. Considerable grading and construction of driveways in connection with this building has been done by the forces of the reservation under Supt. West.

Middlesex Fells Parkway. — It has been the policy of the Commission to construct granolithic walks along abutting property in the parkway where abutters petitioned and signified willingness to pay one-half cost. During the past year sections have been laid under this arrangement between Central Avenue and Malden Street, Medford and Malden, and between Maple Street and Savin Street in Fellsway East. The work has been done by Frank T. Hook, lowest bidder. The cost of the first section was $796.31 and under the second contract $581.03.

Mystic Valley Parkway. — A special maintenance appropriation of $40,000 was made by the Legislature to complete the resurfacing of Mystic Valley Parkway from River Street to Medford Street, Arlington and from High Street to Bacon Street, Medford and Winchester. Bids were received May 11, 1922 and contract was awarded to James H. Fannon, lowest bidder. The price bid was so favorable that a balance remained from the appropriation after the completion of the contemplated work, and the Commission apportioned from funds available an additional amount of $5,000 for the surfacing of the section of the Mystic Valley Parkway Extension from Medford Street to Mystic Street, Arlington. This roadway was not given the hard surface when constructed on account of lack of funds, but subgrade was shaped and oiled for temporary use. The work under contract with James H. Fannon was begun June 28, 1922 and was completed on November 6, 1922, a total of 46,180 square yards, at a total cost of $49,096.60.

Nahant Beach Parkway. — Plans and specifications for the construction of two shelters have been prepared by the Engineering Department. The design for these shelters varies from anything previously constructed in the parks, in that it provides for a division of the area into compartments with glass partitions, giving shelter from whatever direction storms might come. Bids were received on July 27, 1922, and the contract was awarded to Archdeacon & Sullivan, lowest bidder. The work was begun on August 16, 1922 and practically completed on November 30, 1922. The cost has been $4,100 each, a total of $8,200.

Old Colony Parkway. — The Legislature of 1922 made an additional appropriation of $280,000 to provide for the construction of the permanent Neponset Bridge, for which bids have been received several times in the past three years, but always in excess of the appropriation. Bids were again received on June 22, 1922 as follows: —

Aberthaw Construction Co.	$720,597 10
Central Dredging Co.	697,567 00
Bay State Dredging Co.	668,756 00
Coleman Bros.	659,880 00
Holbrook Cabot & Rollins	656,895 00
Wm. L. Miller	655,454 00
Geo. M. Bryne	649,620 00
T. Stuart & Sons Co.	638,005 00
H. P. Converse & Co.	635,259 00
Crandall Engineering Co.	599,150 00

The contract was awarded to the lowest bidder, the Crandall Engineering Co. Work was begun July 7, 1922 and is now in progress. The time set for the completion of the work is December 31, 1923.

West Roxbury Parkway. — Of the appropriation of $75,000 made by the 1920 Legislature for the construction of the parkway from Anawan Avenue to Centre Street, including the bridge over the railroad a balance of $19,433.90 remained. The 1922 Legislature authorized the expenditure of this balance for the construction of the parkway from Centre Street to Weld Street, a distance of 2,350 feet. Bids were received for the work on September 21, 1922. The contract was awarded to Coleman Brothers, and work was begun September 26, 1922 but was not completed on account of winter conditions and was suspended until spring.

Winthrop Parkway. — Bids were again received for the construction of Winthrop Parkway May 18, 1922, from Ocean Avenue, Revere, to Sewall Avenue, Winthrop. This work includes the construction of a granite faced sea wall 2,371 feet in length, concrete retaining walls and the parkway road. The bids received were as follows: —

Crandall Engineering Co.	$251,593 00
Beacon Construction Co.	214,574 50
T. Stuart & Sons	201,297 50
George M. Bryne	193,850 00
Coleman Bros.	185,812 50
Forgione & Romano Co.	173,031 00
Rowe Contracting Co.	169,565 00
A. G. Tomasello & Son	159,627 50

Contract was awarded to the lowest bidder, A. G. Tomasello & Son. Work was begun May 29, 1922, and although nearly completed, was suspended for the winter months. The sea wall and retaining wall construction is completed, and filling and grading made, and a portion of the northerly end surfaced. It was deemed inadvisable to surface and build granolithic walks along the portion where deep fill was necessary back of the sea wall, as the settlement had not wholly taken place. This work has been suspended until spring, when it is expected to be completed by May 30, 1923.

Reservations.

Bunker Hill Reservation. — Further work has been done for the improvement of the grounds around Bunker Hill Monument, consisting of grading and loaming the banks and grassed areas, the cleaning, repairing and painting of the fence, and other miscellaneous work. The work has been done by James H. Fannon, lowest bidder, at a total cost of $6,612.19.

Charles River Reservation U. D. — The work of constructing garage and sanitary building near the Riverside headquarters, which was begun on November 15, 1921 by the contractors, Archdeacon & Sullivan, has been completed at a total cost of $19,251.95.

Plans and specifications were prepared by Desmond & Lord, architects, for a refreshment building located on the southerly side of Commonwealth Avenue, opposite the Riverside headquarters. The contract for the work was awarded to A. Piotti Company, lowest bidder, and work was begun on March 14, 1922, and was completed June 1, 1922 at a total cost of $7,196.00.

Two boat landings have been constructed near the Riverside headquarters,

one at the rear of the sanitary building and one near the refreshment building. Plans and specifications were prepared by this department and the work was done by Frank E. Kneeland, lowest bidder, one at a cost of $927.00 and one at $660.00.

At Charles River Speedway the old wooden seats near the finish line were in poor condition, and insufficient to accommodate the public on race days. They have been replaced by bleachers of reinforced concrete construction. The concrete structure is 200 feet in length, consists of 4 steps or seats in width and will accommodate about 500 people. The work was done by the Engineering Service & Construction Company, lowest bidder, and was completed on July 18, 1922 at a total cost of $2,442.07.

Charles River Reservation L. B. — An amended bill was before the Legislature of 1922, authorizing and directing the construction of certain bridges over the Charles River, including the Cottage Farm Bridge, allowing changes in location from the present sites and correcting the defect in the previous bill in relation to provisions for damages to property owners. This bill was rejected, and the previous act being still in force, the location of the bridges were to be at or near their present sites, as ordered therein. The Commission authorized this department to proceed under the original act, with the construction of a temporary bridge to be used during the construction of the new Cottage Farm Bridge on the present site.

Plans and specifications were prepared by this department, and bids were received on June 29, 1922, the lowest bid being that of the Bay State Dredging & Contracting Company, $59,970.00. The temporary bridge was to be located at a point about 1,200 feet below the present bridge, opposite St. Mary's Street in Boston. This location eliminates the crossing of the Grand Junction Railway with the temporary bridge, and allows its construction at a lower level than the present bridge.

Before a contract was awarded for its construction, the Commission decided not to begin any part of the work for the construction of Cottage Farm Bridge until plans for the permanent bridge had been made and accepted, and license granted by the War Department for its construction. Therefore, the bids for the temporary bridge were rejected.

Surveys and studies were immediately begun for the design for the permanent bridge, and in consultation with the architects, Haven and Hoyt, design was submitted and approved by the Commission on November 23, 1922. The plans to accompany petition for license to the War Department are in progress.

Hemlock Gorge Reservation. — Plans and specifications for the construction of the sanitary building were prepared by this department. The work was done by Archdeacon & Sullivan, and was completed on August 2, 1922 at a total cost of $4,841.27.

Middlesex Fells Reservation. — The work of constructing a concrete garage and storage shed at Pond Street headquarters, service yard, which was begun in November 1921 under contract with S. L. Milton, has been completed and occupied by the department since the first of the year.

The work of constructing a three car garage at police station, Forest Street, Medford, which was begun in November 1921 by contractors, Archdeacon & Sullivan, was completed about December 15, 1921, at a total cost of $6,084.84.

Nantasket Beach Reservation. — Plans and specifications were prepared by this department for the construction of a brick garage and store house, to be located northerly of the boiler house. The design corresponds to that of the boiler house and laundry building which it adjoins. Bids were received March 16, 1922 and contract was awarded to S. C. Sperry & Co., lowest bidder. Work was begun April 17, 1922 and was completed June 30, 1922, at a total cost of $11,484.49.

Plans and specifications have been prepared by this department for men's sanitary building to be located south of the steam boat wharf entrance, near the New York, New Haven and Hartford Railroad line. The building is designed to conform in appearance to the sanitary building constructed about five years ago.

Bids were received on September 28, 1922 and contract was awarded to Archdeacon & Sullivan, lowest bidder. Work was begun on October 9, 1922 and is now in progress.

Quincy Shore Reservation. — The work of furnishing filling material for repairs to the slopes and to provide for the future widening along Quincy Shore Drive, which was awarded to the Gerrish Dredging Company in November 1921, was begun on December 15, 1921 and was completed April 29, 1922. Material was provided by hydraulic dredging in the bay along the shore and deposited behind temporary bulkheads at a total cost of $16,485.90. Further work for shore protection should be done along this shore in the form of concrete bleachers, which would also serve as seats for the people using the beach.

Revere Beach Reservation. — Plans and specifications have been prepared by this department for building addition to the Revere Beach Bath House. The building is to be about 245 feet long by 21 feet wide, is to be of brick walls with reinforced concrete floors and roof, and to contain bath closets and steel lockers. Bids were received on November 23, 1922 for the construction of the bath-house addition, but on account of the fact that they were excessive it was decided to modify the plans somewhat to reduce the expenditure, if possible, at this time. The revised plans are now in progress, and it is expected to call for new bids about the first of the year.

Drawbridges and Locks.

The work of maintenance and operation of drawbridges, locks, sluices and tide gates, has been under the direction of this department. The work of repairs to all bridges under the care and control of this Commission, has been done under the direction of this department, the most important of which were repairs and painting at Wellington Bridge, Saugus River Bridge, Malden River Bridge and the temporary Neponset Bridge.

Twice recently, once in 1921 and once in September 1922, the large gates in the ship lock at Charles River Dam have failed to operate. In both instances it was discovered that the trucks have badly disintegrated from corrosion, and it has been necessary to close the lock for a period of about ten days to replace the damaged trucks with new ones.

Such failures at the lock bring to our attention the fact that it has been in operation for about 14 years, and it is to be expected that repairs and renewals will be required from time to time, with the accompanying interruption to navigation. Repairs which are evident at the present time, and which should be made during the next year, are the renewal of the bearing timbers on the lock gates, new sills in masonry, 6 new wheels under upper gate, new track rails, painting of both gates and repairs to concrete work. Estimates for this work were included in the budget for 1923.

Repairs have been made to the steam line, but the whole line must be renewed in the near future. The operation of the steam plant was discontinued from May 21, 1922 to October 19, 1922. During this time repairs were made to the boiler and plant.

The drawbridge has been resurfaced with oak strips on edge and surfaced with asphalt and sand.

The work of breaking ice in channels and canals at Charles River was done by the boat owned by the Commonwealth. The boat was in commission from December 23, 1921 to March 10, 1922, and the work cost $4,612.38. We had been notified by the government inspectors that the boiler in the tow boat "Hazel Dell" would not pass further inspection. As the boat was old, it was not advisable to expend the cost of a new boiler; therefore, she was sold and work of breaking ice for the season of 1922 and 1923 has been let by contract to W. S. Rendle & Sons, who are to furnish boat at a stated rate per day.

The following is a record of the traffic through locks and drawbridges during the year: —

CHARLES RIVER DAM AND LOCKS.

Number of openings	3,678
Number of vessels	3,855
Number of small boats	2,510
Lumber (feet B. M.)	3,590,834
Coal (tons)	226,303
Oil (barrels)	471,472
Sand (tons)	171,073
Gravel (tons)	103,335
Empty barrels	30,817
Rubble stone (tons)	10,915
Granite (tons)	2,455
Miscellaneous (tons)	1,030

There were 2,391 drawbridge openings.
The small boat lock was opened for eight days only.

Number of openings	48
Number of boats	49

CRADOCK BRIDGE LOCK.

Number of openings	449
Number of boats	641
Number of boats over rollway	58

MALDEN RIVER BRIDGE.

Number of openings	365
Number of vessels	590

TEMPORARY NEPONSET BRIDGE.

Number of openings	303
Number of vessels	385

SAUGUS RIVER BRIDGE.

Number of openings	258
Number of vessels	426

WELLINGTON BRIDGE.

Number of openings	146
Number of vessels	177

GENERAL.

The work of road repairs and maintenance, consisting of patching and surface treatments with bituminous materials, has been done by the forces of the various divisions, under the supervision and direction of the Engineering Department. The work of resurfacing and the reconstruction of roadway surface has generally been done by contract during the past year, instead of by the reservation forces as previously. The contract method was adopted on account of difficulty of obtaining sufficient labor under civil service rules, to make the desired progress with the work.

All bridges under the care and control of the Commission have been inspected twice during the year, and estimates of cost of repairs included in the budget.

Respectfully submitted,

JOHN R. RABLIN,
Chief Engineer & Director of Park Engineering.

REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF WATER DIVISION.

Hon. James A. Bailey, *Commissioner, Metropolitan District Commission.*

Sir: — I respectfully submit the following report of the construction and maintenance operations of the Water Division for the calendar year 1922.

ORGANIZATION.

The organization of the force employed in connection with the operation of the Division has been substantially the same as in 1921 but there have been several changes in personnel.

Benjamin F. Hancox, who had been employed in the drafting force continuously since 1895, and for the past sixteen years as Head Draftsman, retired July 1 on account of poor health. Frank S. Hart, who had been employed in the Sudbury Section continuously since 1891 by the city of Boston and the Commonwealth, and for the past three years as Superintendent, was automatically retired August 3, and November 9 Israel Aubey was appointed Superintendent to fill the vacancy. Arthur E. O'Neil, Superintendent of Pumping Stations since 1906, died October 23 and October 26 Charles P. Stuart was appointed Superintendent to fill the vacancy.

At the end of the year the supervising, engineering and clerical employees numbered 42, and the labor force, engaged in maintaining and operating the works and doing miscellaneous construction work, numbered 295. The maximum total force employed was 372 in June.

METROPOLITAN WATER DISTRICT AND WORKS.

During the year there has been no change in the boundaries of the Metropolitan Water District which includes 19 municipalities with an area of 167 square miles and an estimated population of 1,326,990. The water works lands include an area of about 19,000 acres, of which about 2,200 acres have been planted with pine trees. The works include 9 storage reservoirs with 200 square miles of tributary watershed, storage capacity of 80,000,000,000 gallons and water surface of 8,600 acres; 60 miles of aqueducts; 2 hydro-electric power stations with a capacity of 7,000 horse power; 16 miles of high tension power transmission line; 5 distribution pumping stations with a combined equipment of 6,000 horse power and pumping capacity of 260,000,000 gallons a day; 12 distribution reservoirs with a combined capacity of 2,400,000,000 gallons and 131 miles of distribution mains. The consumption of water from these works during the year was 43,532,488,000 gallons, equivalent to an average daily consumption of 119,267,100 gallons, or 94 gallons per capita.

CONSTRUCTION.

Pumping Equipment, Southern High Service.

The installation of the new cross compound pumping engine No. 16 at Chestnut Hill pumping station No. 1 by the Worthington Pump & Machinery Corporation had progressed so that the engine was first operated January 16. The official

duty trial was successfully made June 6, under a head of 150 feet, the duty performed being 147,756,000 foot pounds per 1,000 pounds of dry steam, or 2,756,000 foot pounds in excess of the contract requirements, and on the following day the engine was successfully tested for capacity, pumping at a rate of 15,000,000 gallons a day under a head of 190 feet.

The chain-driven governor on this engine was not entirely satisfactory, and the builder has substituted a gear drive, but as the change has not been completed the work of laying the iron floor and painting the engine has not been undertaken.

The two new boilers installed in 1921 were first used in January, 1922, and in February a contract was made with Johns Manville, Incorporated, to insulate the new boilers, smoke flue and steam piping with a non-heat-conducting covering containing 85 per cent magnesia. New cast-iron blow-off pipes were laid and about 367 square yards of the old brick floor was replaced with concrete in the boiler room by the Water Division forces.

In May the boiler inspector reduced the allowable steam pressure for boiler No. 4 from 185 to 150 pounds and ordered extensive repairs. Under the circumstances the boiler was of no further use for operating the station, and a contract was made with the Coatesville Boiler Works to furnish a new vertical fire tube boiler 98 inches in diameter to replace it. The new boiler was completed and shipped from Coatesville, Pennsylvania, December 23 but had not arrived at the pumping station at the end of the year. A contract for the removal of the old boiler was made with Youlden, Smith & Hopkins, October 16, and the work was completed November 15.

In connection with the removal of boiler No. 4 the arrangement of the steam mains has been greatly improved so that there are now duplicate mains through either of which steam can be furnished from any of the boilers to any of the engines.

The erection of the Underwood coal conveyor was completed in July and it is a very satisfactory and economical equipment.

The total expenditure for the additional southern high-service machinery to the end of the year is $154,340.31. Obligations under current contracts amount to $14,422. The installation of boiler No. 22 and rearrangement of flues and economizer will cost several thousand dollars. The entire work will, therefore, be completed well within the available appropriation of $200,000.

Arlington Reservoir.

On January 10 a contract was made with Walsh's Holyoke Steam Boiler Works to remove and dispose of the old standpipe on Arlington Heights and to erect a new steel tank on the same site on an enlarged foundation built in 1921. The old tank was 60 feet in height and 40 feet in diameter and had a capacity of about 564,000 gallons. The new steel tank is 61 feet 3 inches in height and 75 feet in diameter and has a capacity of about 1,995,000 gallons. The bottom of the tank is made of plates $\frac{3}{8}$ of an inch in thickness and the side plates vary in thickness from $1\frac{1}{8}$ inches in the lower course to $\frac{3}{8}$ of an inch in the seventh and eighth courses at the top of the tank. The work of removing the old standpipe was begun March 27 and was completed May 3. The work of erecting the new tank was begun April 25 and on May 25 the bottom of the tank was lowered on to a bed of dry sand and cement mixed in equal parts and spread evenly over the top of the concrete foundation. The tank was filled with water for the first time July 19, but as some leakage developed it was drained and refilled again on July 27 and again on August 22 because of additional work necessary to make it acceptable.

The work of cleaning with a sandblast and painting the steel tank was begun by Maurice M. Devine August 29 and was completed November 18. The interior of the tank was painted three coats and the exterior two coats of paint made from ingredients furnished by the Division. The 16-inch force and discharge main connections and the 6-inch blow-off connection with the tank were made in July.

Bids were received June 29 for constructing a granite masonry tower to enclose the steel tank but as the lowest bid, which amounted to $161,900, exceeded the amount of the appropriation remaining available by $42,000, all bids were rejected and the work has been deferred until additional funds are available.

The total expenditure for the Arlington Reservoir to the end of the year is $49,713.95. Obligations under current contracts amount to $5,133.70, leaving $120,152.35 available for the masonry tower.

Northern High-service Pipe Lines.

In connection with the work of reinforcing the northern high-service pipe lines in Everett, Malden, Medford and Somerville, a contract was made February 20 with the Warren Foundry & Machine Company for 3,150 tons of 20-inch, 24-inch and 30-inch cast-iron pipes, and with the United States Cast Iron Pipe & Foundry Company for 50 tons of special castings.

June 20 a contract was made with George M. Bryne of Winchester for laying the 20-inch pipes and July 17 a contract was made with Kelley & Sullivan of Somerville for laying the 24-inch and 30-inch pipes.

The 30-inch pipe line extends for a distance of 1,319 feet in a southerly direction from the existing 36-inch main in Highland Avenue at Elm Street in Malden to Charles Street, and from this point the 24-inch pipe line extends for a distance of 10,522 feet in an easterly direction to Hancock Street at Broadway in Everett, where connection was made with the existing 24-inch main. For a distance of 390 feet in Jackson Street, where the trench was excavated in soft material, the 24-inch pipes are supported by spruce piling and for a distance of 60 feet at the crossing under the Saugus Branch of the Boston & Maine Railroad pipes with spherical joints were used, which are more flexible than the regular joints and better adapted to the special conditions at this place. Many underground structures and unusual conditions encountered on these lines made the work difficult and progress slow, and pipe laying was not completed until December 31.

The 20-inch pipe line extends southerly and westerly from the 30-inch line in Highland Avenue at Charles Street for a distance of 14,155 feet to Winchester Street at Morton Avenue in Medford near the Somerville boundary line, where it was connected with an existing 16-inch main. For a distance of 7,671 feet the 20-inch main is located in private ways and lands where easements were acquired for the purpose. For a distance of 48 feet under the Medford Branch of the Boston & Maine Railroad and of 348 feet under the Mystic River pipes with spherical joints were used because of special conditions, and for a distance of 2,050 feet in the marshes on both sides of the Mystic River the pipes are supported on spruce piling. Where the pipes were laid in private land and are readily accessible the joints were made with joint compound instead of lead for a total length of 6,960 feet, of which 4,130 feet were laid with "Lead-hydro-tite" and 2,830 feet with "Metalium". When the pipes were first filled with water under pressure these joints leaked considerably, but the leakage decreased rapidly, and after a few days was less than one-third of the original amount, and it continued to diminish for some time. The saving by using the joint compounds instead of lead is $2,588.00. All pipe laying for the 20-inch line was completed November 29.

The sum of $280,000 was appropriated for these pipe lines, of which $239,715.90 has been expended. Obligations under current contracts amount to $36,715.92 leaving a few thousand dollars which will be required for land damages and additional work.

Pumping Equipment, Northern High Service.

A contract was made with the Coatesville Boiler Works July 24 for furnishing a vertical fire tube boiler 98 inches in diameter and 24 feet in height for the Spot Pond pumping station. The boiler was completed and shipped from Coatesville, Pennsylvania, December 26 but had not been received at the close of the year. The new pumping engine has not yet been contracted for.

Weston Aqueduct Supply Mains.

Further plans and studies have been made for the proposed Weston Aqueduct Supply Mains from Weston to Medford for reinforcing the northern high-service supply, but no construction work has been undertaken.

MAINTENANCE.

Precipitation and Yield of Watersheds.

The precipitation on all the watersheds was noticeably above normal in May and June and below normal in November. The total for the year was 49.86 inches or more than 9 per cent above normal on the Wachusett, 45.60 inches or more than 2 per cent above normal on the Sudbury and 47.01 inches or more than 4 per cent above normal on the Cochituate watershed.

The average daily yields from the watersheds in million gallons per day per square mile was 1,321,000, or about 20 per cent above normal, from the Wachusett; 980,000, or about normal, from the Sudbury and 1,099,000, or about 18 per cent above normal, from the Cochituate. These abundant yields filled the reservoirs early in April and it was necessary to waste water almost continuously until late in September.

Between June 15 and December 15 the city of Worcester discharged 492,300,000 gallons of water into the Wachusett Reservoir watershed from the area formerly tributary to the reservoir diverted in 1911, and by agreement made at that time the city will be paid $2.00 a million gallons for this water, but no payment will be made for 851,700,000 gallons of water which were received in this manner from the city at other times during the year, as the Wachusett Reservoir filled before June 15.

Storage Reservoirs.

The capacities of the storage reservoirs of the Metropolitan Water Works, the elevation of the water surfaces, and the quantity of water stored in each reservoir at the beginning and at the end of the year are shown by the following table: —

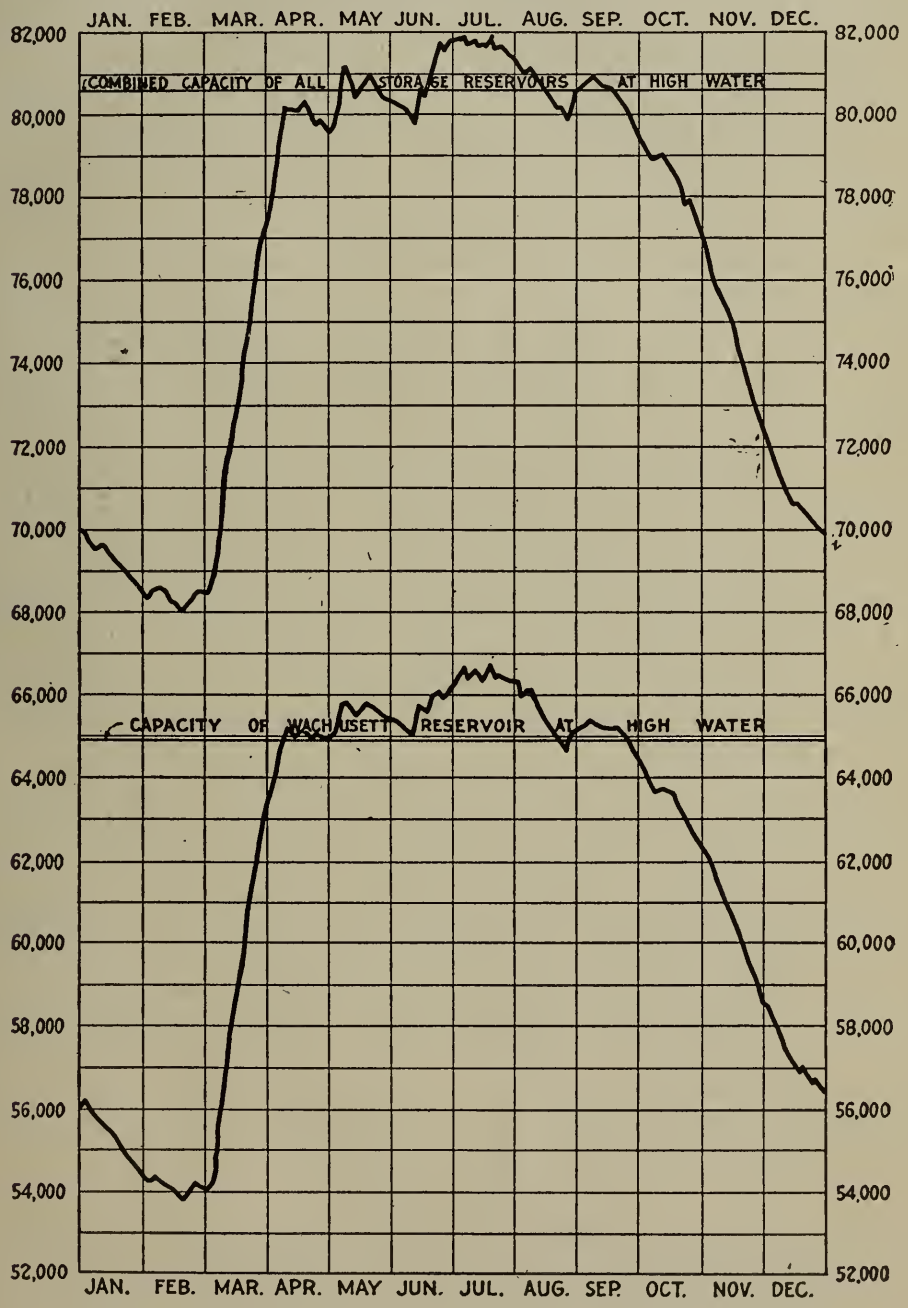
Storage Reservoirs.	Elevation[1] of High Water.	Capacity (Gallons).	Jan. 1, 1922.		Jan. 1, 1923.	
			Elevation[1] of Water Surface.	Amount stored (Gallons).	Elevation[1] of Water Surface.	Amount stored (Gallons).
Cochituate watershed: —						
Lake Cochituate[2]	144.36	2,097,100,000	143.04	1,785,700,000	142.79	1,727,500,000
Sudbury watershed: —						
Sudbury Reservoir	260.00	7,253,500,000	257.84[3]	6,360,000,000	257.79	7,165,300,000
Framingham Reservoir No. 1	169.32	289,900,000[4]	167.79	220,000,000	166.00	149,500,000
Framingham Reservoir No. 2	177.87	529,900,000[4]	176.08	485,200,000	176.07	484,700,000
Framingham Reservoir No. 3	186.74	1,180,000,000[4]	184.67	1,032,700,000	185.09	1,066,200,000
Ashland Reservoir	225.21	1,416,400,000	224.43	1,373,500,000	224.40	1,371,800,000
Hopkinton Reservoir	305.00	1,520,900,000	304.10	1,464,600,000	304.04	1,460,900,000
Whitehall Reservoir	337.91	1,256,900,000	336.94	1,068,800,000	335.38	774,500,000
Farm Pond	159.25	167,500,000	159.03	155,700,000	158.98	153,000,000
Wachusett watershed: —						
Wachusett Reservoir	395.00	64,968,000,000	388.21	56,072,600,000	388.50	56,441,800,000
Totals	–	80,680,100,000	–	70,018,800,000	–	70,795,200,000

[1] Elevation in feet above Boston City Base.
[2] Excluding Dudley Pond which was abandoned April 3, 1916.
[3] Below Circular Dam.
[4] To top of flashboards.

The diagram on page 21 shows the quantity of water stored in the Wachusett Reservoir and the quantity stored in all the storage reservoirs combined during the year.

The table and diagram show the total storage which could be drained from the reservoirs. Special provisions would be necessary, however, to draw about 10,000,000,000 gallons of this storage for consumption, as it is below the outlet channels which can be conveniently used for regular service.

QUANTITY OF WATER STORED IN THE WACHUSETT RESERVOIR AND IN ALL THE STORAGE RESERVOIRS COMBINED DURING 1922



Wachusett Reservoir.

At the beginning of the year the water in Wachusett Reservoir was 6.79 feet below the designed high-water line, elevation 395, and there were over 56,000,000,000 gallons in storage. On February 18 the water was 8.58 feet below high-water line, the lowest stage during the year. On March 5 the water began to rise rapidly and the reservoir filled to elevation 395 on April 8, and by wasting water almost continuously the reservoir was held at about this elevation until September 22. The highest stage reached was 396.24 on July 10, with over 66,600,000,000 gallons in storage. At the close of the year the water was at elevation 388.50 and there was over 56,400,000,000 gallons in storage.

Nearly 15,000,000,000 gallons of water were wasted from the reservoir during the year, in addition to 597,400,000 gallons discharged into the Nashua River in accordance with the provisions of section 14 of chapter 92 of the General Laws. The maximum rate of waste from the reservoir was 762,000,000 gallons per day on May 6.

On January 17 the Central Building Company of Worcester completed the work of facing with granite the crest of the circular concrete dam at the mouth of the Quinapoxet River.

Drift material was removed from the shore of the reservoir and brush and weeds were cut and burned along the margins of the reservoir, adjacent highways and directly tributary brooks and rivers, the work extending over a distance of about 68 miles.

The work of fencing the water works lands was continued for a distance of 23,600 feet in Clinton, West Boylston and Sterling. A new engine was installed in the patrol boat and the boat was thoroughly overhauled and repainted.

All the iron and wood work in the gate and storage chambers at the dam and the interior and exterior woodwork of the power house and the interior woodwork of the garage were painted. The driveway below the dam was resurfaced and bound with two coats of Tarvia B. Two single stick flagpoles, each 40 feet in height above the ground, made from white pine trees cut on water works land, were erected at the upper entrance to the dam. There was set out on the grounds below the dam 263 hemlock, 240 arbor vitæ, 40 white pine and 50 white hawthorn trees 3 to 10 feet in height.

Considerable work was done in connection with the maintenance of houses, barns and out buildings located on water works lands. Work on the buildings located on the hill east of the dam in Clinton included the repairing of the Beaven house, which was partially destroyed by fire on April 20, the painting of the outside of the Kramer house, barn and out buildings and the reshingling of roofs of the barn and outbuildings at the Kramer place, and of the store-house and portions of the carpenter shop and other buildings at the Wilson Street yard. Work on the buildings located in Boylston included removal of the barn at the Tucker place and repairs at the Kendall house. At the Cook place in West Boylston the house and carriage shed were repaired and the house, barn and shed were repainted on the outside.

Standing grass on 297 acres of water works lands was sold at auction for the sum of $1,349.75.

Sudbury Reservoir.

The flash-boards were placed on the overflow at the Sudbury Dam April 8 and were removed December 1. On account of a sudden yield from the watershed on three occasions 137,900,000 gallons of water overflowed from Sudbury Reservoir into Framingham Reservoir No. 3 and was not used for generating electric energy.

Extensive alterations and repairs were made in the department house located a short distance below the dam. The sheet iron storehouse and other ironwork about the grounds, the life buoys and their supports and fence around the lightning arrester chamber were painted.

Brush and weeds were mowed along the shore of the reservoir. The usual care has been taken of the reservoir lands and grounds and structures at the dam. Fifteen tons of hay were obtained from the land below the dam.

Framingham Reservoir No. 3.

Framingham Reservoir No. 3 was used throughout the year as a regulating reservoir in connection with the operation of the Sudbury power station and the Sudbury Aqueduct. For this service it was necessary to keep the flash-boards on the overflow at the dam during the entire year and to allow the water in the reservoir to fluctuate through a range of about 4½ feet. The lowest stage was elevation 182.35 in January, and the highest stage was elevation 186.89 in April. On account of the large yield of the watersheds about 4,000,000,000 gallons of water was allowed to overflow from the reservoir into Framingham Reservoir No. 1 to be wasted down the Sudbury River. The shore of the reservoir and the embankment, grounds and shrubs at the dam and the gate-house were given the usual attention. Sprouts and brush were cut in the lanes along the property lines for a width of 5 feet.

Framingham Reservoirs Nos. 1 and 2, Ashland, Hopkinton and Whitehall Reservoirs.

On account of objectionable color no water was drawn for water supply from the southerly portion of the Sudbury watershed, including an area of about 47 square miles tributary to Framingham Reservoir No. 1 and including Framingham Reservoir No. 2, Ashland, Hopkinton and Whitehall reservoirs. The entire yield of this portion of the watershed was wasted into the Sudbury River below the dam at Framingham Reservoir No. 1 and the elevations of the water in the various reservoirs was regulated by the use of flash-boards and sluice gates to provide for freshets or moderate yields, as required. A minimum waste of 1,500,000 gallons per day into the Sudbury River at the dam of Framingham Reservoir No. 1 was maintained each day, as required by chapter 177 of the Acts of 1872.

The dams, gate-houses and other structures and the grounds and waterworks lands at all of these unused reservoirs have received the necessary attention, and sprouts and brush have been mowed in the lanes along the property lines for a width of 5 feet.

At the foreman's headquarters at Framingham Reservoir No. 1 the new garage has been completed, a hot water heater was installed in the department house occupied by the foreman and electric lights were installed in the house, barn and garage.

In November and December the water in Framingham Reservoir No. 1 was drawn down below elevation 162 and 14 joint leaks were repaired in the 48-inch pipe line laid across the reservoir in 1878 between Dam No. 1 and Dam No. 3. In connection with this work a 2½-inch air valve was installed in the pipe line at its upper end at Dam No. 3 and one was also installed at the same place in the second 48-inch pipe line laid in 1897. As a result the capacity of both lines has been noticeably increased.

At Ashland Reservoir the upper courses of the outside brick facing of the gate-house were relaid, the roof and gutters were repaired, and the chimney rebuilt above the roof. The roof of the department house was shingled and both chimneys rebuilt above the roof.

At Hopkinton Reservoir a wire fence was built on the easterly side of Cedar Street for a distance of 270 feet, with two gates, so that the removal of gravel from a pit on water works land could be properly controlled. Six new bounds were set on the west side of the street to mark the corners of the water works land.

An examination of the old wooden bulkhead and sluice gates in the dam at the outlet of Whitehall Reservoir was made in September and as they were found to be unsafe for further use temporary stop-planks were put in the screen grooves in the upstream face of the dam back of the gates and water was drawn from the

reservoir until the old coffer-dam, located about 140 feet above the outlet dam, was exposed above the water. Stop-planks were then put in the sluiceway of the coffer-dam so that the elevation of the water in the reservoir could be controlled at the coffer-dam while new gates are being installed in the outlet dam.

Farm Pond.

The water in Farm Pond varied between elevation 159 and 159.9 during the year. No water was diverted from outside sources into the pond and no water was wasted therefrom. Under rights reserved by legislation the town of Framingham pumped approximately 139,600,000 gallons of water from the filter-galleries on the easterly shore of the pond for water supply and the Boston & Albany Railroad took approximately 76,900,000 gallons and the New York, New Haven & Hartford Railroad approximately 58,400,000 gallons directly from the pond for use in locomotives. No water is used from the pond by the Metropolitan Water District.

Lake Cochituate.

The water in Lake Cochituate was kept within one or two feet of high-water line for use in case of emergency, but no water was required from this source during the year. The lowest stage of the water in the lake was elevation 142.59 in December, and the highest elevation 144.33 in June. Weeds and brush were mowed for a width of about 20 feet along the Bannister Brook surface water drain for a distance of 5,000 feet and along Snake Brook for a distance of about 3,000 feet. Sediment was removed from the surface water drain and appurtenant catch basins and sedimentation chamber. Sprouts and brush were cut for a width of 5 feet and burned in the lanes along property lines. Painting was done at the gate-house, outlet dam, shop and barn. The new garage at the foreman's headquarters was completed, a cement concrete floor was laid in the barn cellar and a new cesspool was dug at the house in preparation for the installation of a bathroom.

AQUEDUCTS.

Wachusett Aqueduct.

Water was drawn from the Wachusett Reservoir through the Wachusett Aqueduct on 296 days. The aqueduct was in use 138 days, 7 hours and 23 minutes and 37,430,800,000 gallons of water was drawn from the reservoir, equivalent to 102,550,000 gallons per day for the entire year. With the exception of 8,000,000 gallons by-passed around the water wheels on Sunday October 8, all the water was used to generate electric energy before it was discharged into the Wachusett Aqueduct.

The Westborough State Hospital pumped 81,704,000 gallons of water from the aqueduct at the terminal chamber, equivalent to an average of 224,000 gallons per day.

The granolithic top of the Assabet Bridge was repaired. The ironwork at all of the bridges and at the upper and lower dams on the open channel and the woodwork at the dams was cleaned and painted and the masonry was repointed at the upper dam.

Wire fences were erected on property lines to replace wooden rail fences built in 1897 and at places not previously fenced for a distance of 1,607 feet at a cost of 32 cents per foot exclusive of the fence posts which were obtained from water division land. This fence cost more than usual because the work was done in short sections. Two of the ten watering places for cattle along the open channel were rebuilt so that the water would be filtered as it enters the channel.

About 8 acres of land near the terminal chamber was regraded and sown with grass seed, and brush, grass and weeds were mowed and disposed of for a distance of 10 miles along the aqueduct at a cost of about $208 a mile.

Sudbury Aqueduct.

Water was drawn from Framingham Reservoir No. 3 through the Sudbury Aqueduct continuously during the year. Of the 26,479,500,000 gallons of water drawn from the reservoir about 282,100,000 gallons were pumped from the aqueduct by the town of Framingham to supplement the supply from the filter-galleries at Farm Pond, and 26,197,400,000 gallons, equivalent to an average of 71,773,700 gallons per day, were discharged into Chestnut Hill Reservoir.

The old wooden building near Leland Street in Sherborn, used as a gaging chamber, was replaced by a new brick building with granite trimmings at a cost of $2,367.00 exclusive of the granite trimmings which were cut by regular employees from stones removed some years ago from the old dam at Lake Cochituate.

The usual work has been done cutting and disposing of brush, grass and weeds and painting ironwork, cleaning culverts, repairing fences and caring for the aqueduct lands and structures.

Weston Aqueduct.

Water was drawn from the Sudbury Reservoir into the Weston Aqueduct on 304 days. The aqueduct was in use for 171 days, 23 hours and 6 minutes. Of the 16,282,200,000 gallons drawn from the reservoir 15,631,400,000 gallons, equivalent to an average of 42,825,750 gallons a day, were delivered into the Weston Reservoir and 650,800,000 gallons were diverted at the head-house into Framingham Reservoir No. 3 after being used for generating electric energy.

All of the ironwork in the head-house, gaging and siphon chambers, the manhole ladders and covers were painted.

The department house at Nobscot, occupied by one of the employees, which was partially destroyed by fire during the absence of the family September 2, was repaired and painted and wired for electric service.

Grass, brush and weeds on aqueduct land were cut and disposed of. Sediment was removed from culverts and they were kept free from ice and snow during the winter. The fences were repaired where necessary. In connection with the work of repairing fences 350 fence posts were renewed.

Cochituate Aqueduct.

The Cochituate Aqueduct was kept ready for use in case of emergency, but was not required during the year. The ironwork at pipe chambers, waste-weirs and manholes was painted. Grass, brush and weeds were cut on the aqueduct lands and disposed of and the culverts were kept open.

Protection of Water Supply.

A sanitary inspector, two watershed inspectors and three watchmen were employed throughout the year to inspect the condition of premises on the watersheds and ice cutting operations, and to prevent pollution of the water in the reservoirs. The filters at Sterling, Sterling Junction, West Boylston, Marlborough and Natick have been operated throughout the year to prevent pollution of the water supply at these places. During large flows of surface water in excess of the capacity of the filters at Sterling, Marlborough and Natick, the water was sterilized with calcium hypochlorite before it entered the reservoirs.

A power saw is now used for cutting ice on Sudbury Reservoir and the use of horses for this work is no longer permitted.

Extensive repairs were begun in September at the pumping station at Pegan filters at Lake Cochituate, as the machinery had been in regular service since it was installed in 1903 and was in poor condition. Both of the engines were thoroughly overhauled and repaired at the machine shop at Chestnut Hill pumping station. The 8-inch centrifugal pump on Unit No. 1 was replaced with a 10-inch pump. A new condenser air pump and new boiler feed pump were installed, and a

500 watt electric lighting set and two new vertical fire tube boilers 54 inches in diameter were ordered but had not been received at the close of the year.

The swamp drainage ditches with an aggregate length of 36.78 miles were given the usual attention. Brush and weeds were cut for a width of 10 to 20 feet along both banks. Sediment was removed from the ditches, culverts and watering places and repairs were made where necessary.

A parcel of cut over woodland adjacent to Big Crane Swamp in Westborough, containing 14.35 acres, was purchased of Romeo E. Allen and 762 feet of wire fence was constructed on the new boundary line for the protection of the water supply.

Clinton Sewage Disposal Works.

Works for disposing of the sewage of the town of Clinton were operated as required by chapter 557 of the Acts of 1898.

On May 6 to 11, June 20 to 24 and July 4 to 7, inclusive, the flow in the intercepting sewer exceeded the capacity of the pump and overflowed into the Nashua River, but as it was diluted with a large quantity of water wasting from the Wachusett Reservoir the conditions were not objectionable. On the remaining 350 days the pumpage averaged 1,611,000 gallons per day. The cost of operating the pumping station was $3,651.17 or at the rate of $6.48 per million gallons and 13.2 cents per million foot gallons. On December 12 the pump was fitted with a new type open impeller which operates satisfactorily without a second screening of the sewage which was necessary with the old impeller.

On account of the large volume of sewage and the poor condition of the filters it was necessary from March 8 to May 5 and November 29 to December 20, inclusive, to dispose of the sewage by irrigation on water works land adjacent to the filter-beds. The clogged filtering material was removed from three of the one-acre beds to a depth of 7 or 8 inches and their capacity was materially increased. The total cost of operating the filters was $9,058.44 or at the rate of $16.07 per million gallons filtered.

Forestry.

About 16,600 white pine and 4,000 red pine seedlings were planted on 9 acres of the Wachusett Reservoir land at the mouth of the Quinapoxet River and for replacing seedlings that had died in previous plantings. Five hundred white pine seedlings were planted at Sudbury Reservoir to replace trees destroyed by fires. As usual considerable work was done in protecting the plantings from the pine-tree weevil and in spraying trees on selected areas and destroying egg clusters to protect the trees from gypsy and browntail moths. The amount expended in protecting the trees and plantings from insects was $6,506 and the total expenditures for forestry amount to $32,093.75.

Hydro-electric Service.

During the year 15,327,768 kilowatt hours of electric energy were delivered from the hydro-electric stations operated by the water drawn from the Wachusett and Sudbury reservoirs. The total value of this energy at contract prices, including rentals of $139 for transmission line locations, is $85,896.56. The total expense charged to operation of both stations and transmission lines is $57,438.96, leaving a profit from the operation of the stations of $28,457.60, equivalent to $1.857 per thousand kilowatt hours. Of the total energy delivered from both stations this year, 2,003,702 kilowatt hours of energy, for which $10,967 was received, were generated with water wasted from the reservoirs and not required for water supply.

Wachusett Service.

The work of installing modern open system governing equipment, which was in progress at the close of last year, has been completed. The top half of the original scroll case on turbine No. 1 was replaced with a new and thicker casting.

The chestnut poles on the single circuit 66,000-volt transmission line, which extends for a distance of about 16 miles from the Wachusett to the Sudbury power stations, were all examined at the ground line. It was found necessary to remove the decayed wood to a depth of from one-half an inch to an inch from the butts of 78 per cent of the poles. The newly exposed surface was treated with a preparation of creosote. One hundred two of the chestnut poles and the 14 steel towers were repainted with one coat of bronze green paint.

The double circuit 13,800-volt line, between the lightning arrester station and the New England Power Company's lines, which was repaired temporarily after the ice storm of November, 1921, was entirely rebuilt for a distance of about 600 feet under a contract with the New England Power Company, without interfering with the regular service.

An electric steam generator, manufactured by the Electric Furnace Construction Company of Philadelphia, with a capacity of 60 kilowatts, was installed for use in heating the station and offices in place of the Gurney steam boiler. The use of coal for heating purposes has now been dispensed with and a noticeable saving has been made in the annual cost of heating.

The Wachusett power station was operated on 294 days. The statistics for the year 1922 are as follows: —

Total energy developed (kilowatt hours)			9,553,200
Energy used at power station (kilowatt hours)			24,347
Available energy (kilowatt hours)			9,528,853
Water used (gallons)			45,169,700,000
Average head (feet)			96.1
Energy developed per million foot gallons (kilowatt hours)			2.201
Efficiency of station (per cent)			70.0
Credits:			
Energy sold New England Power Company and Edison Electric Illuminating Company, 9,326,272 kilowatt hours at $0.0053		$49,429 24	
Deduction of 2 per cent as provided in contract, 186,525 kilowatt hours at $0.0053		988 58	
		$48,440 66	
Energy furnished Clinton sewerage pumping station, 202,581 kilowatt hours at $0.0053		1,073 68	
Rental, transmission line location		139 00	
			$49,653 34
Charges:			
Superintendence		$2,039 74	
Labor, operating station		11,271 00	
Repairs and supplies:			
Power station	$9,525 16		
Transmission line	1,867 63		
		11,392 79	
		$24,703 53	
Taxes		3,800 00	
Administration, general supervision, interest and sinking fund		10,019 16	
			38,522 69
Profit			$11,130 65
Cost of available energy per thousand kilowatt hours			$4.043

Sudbury Service.

The hydro-electric station at the Sudbury Dam in Southborough was operated on 304 days; 84 with 3 shifts and 220 with 2 8-hour shifts.

The slip rings on units Nos. 1 and 2 were resurfaced by the Lundin Electric Company in August.

Statistics for the year 1922 are as follows: —

Total energy developed (kilowatt hours)		5,808,430
Energy used at power station (kilowatt hours)		9,515
Available energy (kilowatt hours)		5,798,915
Framingham Reservoir No. 3 service:		
Water used (gallons)		28,657,200,000
Average head (feet)		65.79
Weston Aqueduct service:		
Water used (gallons)		15,631,400,000
Average head (feet)		40.87
Energy developed per million foot gallons (kilowatt hours)		2.301
Efficiency of station (per cent)		73.3
Credits:		
Energy sold Edison Electric Illuminating Company of Boston, 5,798,915 kilowatt hours at $0.00625		$36,243 22
Charges:		
Superintendence	$1,212 88	
Labor, operating station	10,669 97	
Repairs and supplies	560 42	
	$12,443 27	
Taxes	1,432 20	
Administration, general supervision, interest and sinking fund	5,040 80	
		18,916 27
Profit		$17,326 95
Cost of available energy per thousand kilowatt hours		$3.262

Distribution Pumping Stations.

The total pumpage at the five distribution pumping stations during 1922 was 30,471,400,000 gallons; 1,042,890,000 gallons or 3.54 per cent more than in 1921. About 69 per cent of the water supplied in the Metropolitan Water District in 1922 was pumped for the northern high and extra high services and the southern low and high services, and 0.73 per cent was repumped for the southern extra high service. The cost of operating all of the pumping stations for the year 1922 was $220,448.96.

At the beginning of the year there were 2,515 net tons of bituminous coal and 655 net tons of anthracite screenings on hand at the pumping stations. During the year 7,688 net tons of bituminous coal and 1,464 net tons of anthracite screenings were received. At the close of the year 1,356 net tons of bituminous coal and 317 net tons of anthracite screenings were on hand at the pumping stations.

At Chestnut Hill station No. 1 the new Snow cross compound pumping engine, No. 16, and new vertical fire tube boilers, Nos. 20 and 21, were put into service in January. A Perfection grate was installed in boiler No. 12, a new platform scale for weighing the coal used was installed in the coal room and the old scale was removed to the boiler room for weighing ashes and materials received. A new concrete floor was laid in front of the coal bins and the new coal conveyor was put into service in July and the old coal hoist was removed late in the year. The electric lighting unit was relocated in the engine room basement, in the rear of engine No. 16, and the old temporary wooden building in the rear of the boiler room, in which it was formerly located, was removed. Guards were installed at

fly-wheel hubs and on top of cylinders at engine No. 4 and at light wells in the engine room floor and general repairs were made on engines Nos. 1, 3 and 4.

At Chestnut Hill station No. 2 a new waste washing machine and a Westinghouse air compressor were installed. Six stay bolts were replaced in boiler No. 6 and 26 in boiler No. 15. Railings for platforms on top of the cylinders and guards for fly-wheel hubs were installed on engines Nos. 5, 6 and 7 and No. 12, and general repairs were made on these engines. A Weston radial drill was installed in the machine shop in November.

At Spot Pond station extensive repairs were made on engine No. 9 between April 12 and May 15. During this period it was necessary to operate engine No. 8 24 hours a day. A 40 horse power Whitlock feed water heater was installed on the boiler feed line in March.

At Arlington station continuous operation was necessary from March 24 to November 11 while the old standpipe on Arlington Heights was being removed and the new standpipe was being built. This made it necessary to employ a fireman on the last watch during this period. General repairs were made on the boilers and engines as required.

At Hyde Park station continuous operation was necessary from October 9 to December 18 while the steel tank at Bellevue Reservoir was being repainted, and this required an extra man on the second and third watches. The engines and boilers at this station have been given the necessary attention to keep them in good repair.

The station duties based on plunger displacement and with no allowance for steam used for heating and lighting have averaged as follows: —

Chestnut Hill station No. 1, 76,725,000 foot pounds per 100 pounds of mixed coal averaging 14,400 British thermal units per pound.
Chestnut Hill station No. 2, 133,006,000 foot pounds per 100 pounds of mixed coal averaging 14,400 British thermal units per pound.
Spot Pond station, 106,904,000 foot pounds per 100 pounds of mixed coal averaging 13,900 British thermal units per pound.
Arlington station, 54,084,000 foot pounds per 100 pounds of mixed coal averaging 13,900 British thermal units per pound.
Hyde Park station, 48,853,000 foot pounds per 100 pounds of mixed coal averaging 13,500 British thermal units per pound.

Distribution Reservoirs.

The locations, elevations and capacities of the distribution reservoirs of the Metropolitan Water Works are shown by the following table: —

Distribution Reservoirs and Locations.	Elevation of High Water.[1]	Capacity in Gallons.
Low Service:		
Spot Pond, Stoneham and Medford	163.00	1,791,700,000
Chestnut Hill Reservoir, Brighton district of Boston	134.00	300,000,000
Weston Reservoir, Weston	200.00	200,000,000
Mystic Reservoir, Medford	157.00	26,200,000
Northern High Service:		
Fells Reservoir, Stoneham	271.00	41,400,000
Bear Hill Reservoir, Stoneham	300.00	2,450,000
Northern Extra High Service:		
Arlington Reservoir, steel tank, Arlington	442.50	2,000,000
Southern High Service:		
Fisher Hill Reservoir, Brookline	251.00	15,500,000
Waban Hill Reservoir, Newton	264.50	13,500,000
Forbes Hill Reservoir, Quincy	192.00	5,100,000
Forbes Hill Standpipe, Quincy	251.00	330,000
Southern Extra High Service:		
Bellevue Reservoir steel tank, West Roxbury district of Boston	375.00	2,500,000
Total	–	2,400,680,000

[1] Elevation in feet above Boston City Base.

By arrangement with the city of Chelsea a portion of the maintenance of its reservoir on Powder Horn Hill is assumed by the Metropolitan Water Works, and the reservoir is used when necessary in connection with the northern high-service supply. The reservoir has a capacity of 1,000,000 gallons with high-water line at elevation 196.6. The reservoir was in service from January 1 to April 12, inclusive, and from December 13 to 31, inclusive, and when not in service was kept full of water for emergency use.

By arrangement with the city of Malden its standpipe on Waitt's Mount, with a capacity of 1,120,000 gallons to high-water line at elevation 250, is maintained by the Division, and during the year has been kept full of water for use in case of emergency. Between September 18 and November 3 the slate roof was repaired and the outside of the tank was painted at a cost of $1,037.56.

The old standpipe on Arlington Heights was kept in service until March 25. The work of removing the standpipe and replacing it with a larger steel tank, more than 3½ times the capacity of the old standpipe, was begun on March 27 and completed November 18.

The steel tank on Bellevue Hill in West Roxbury was drained October 9 and the tank and steel roof of the tower were repainted. Three coats were applied on the inside of the tank, and one coat was applied on the outside of the tank and steel roof by George E. Babcock of Medford, who completed the work on December 12. The tank was filled and put into service again on December 18. By arrangement with the town of Brookline its high service tank, which is about the same elevation as the Bellevue tank, was used as a regulator for the southern extra high service pumping while the work was in progress. The ironwork of the masonry tower was painted by the regular employees of the Division in June.

In accordance with a vote of the Commission the Bellevue tower was opened to the public, under the supervision of the Park Division police, on June 17 and has since been open on Sundays and holidays between the hours of 2 P.M. and sunset.

The steel tank on Forbes Hill in Quincy was drained October 19, and the interior and exterior surface of the tank and the woodwork and ironwork of the masonry tower were repainted by the W. L. Waples Company of Boston. The inside of the tank was given three coats of paint. The outside of the tank was touched up in places and given one coat of paint, and the woodwork and ironwork of the tower were given two coats of paint. The lower end of the 12-inch drain from the Forbes Hill Reservoir and standpipe was removed from private land where it was originally laid and now discharges into the roadway. The chimney of the gate-house at Fisher Hill Reservoir was struck by lightning June 9 and considerably damaged.

The lands, trees, shrubs and structures at all of the Distribution reservoirs have received the necessary attention and the sluice gates and screens have been operated as required.

Distribution Buildings and Grounds.

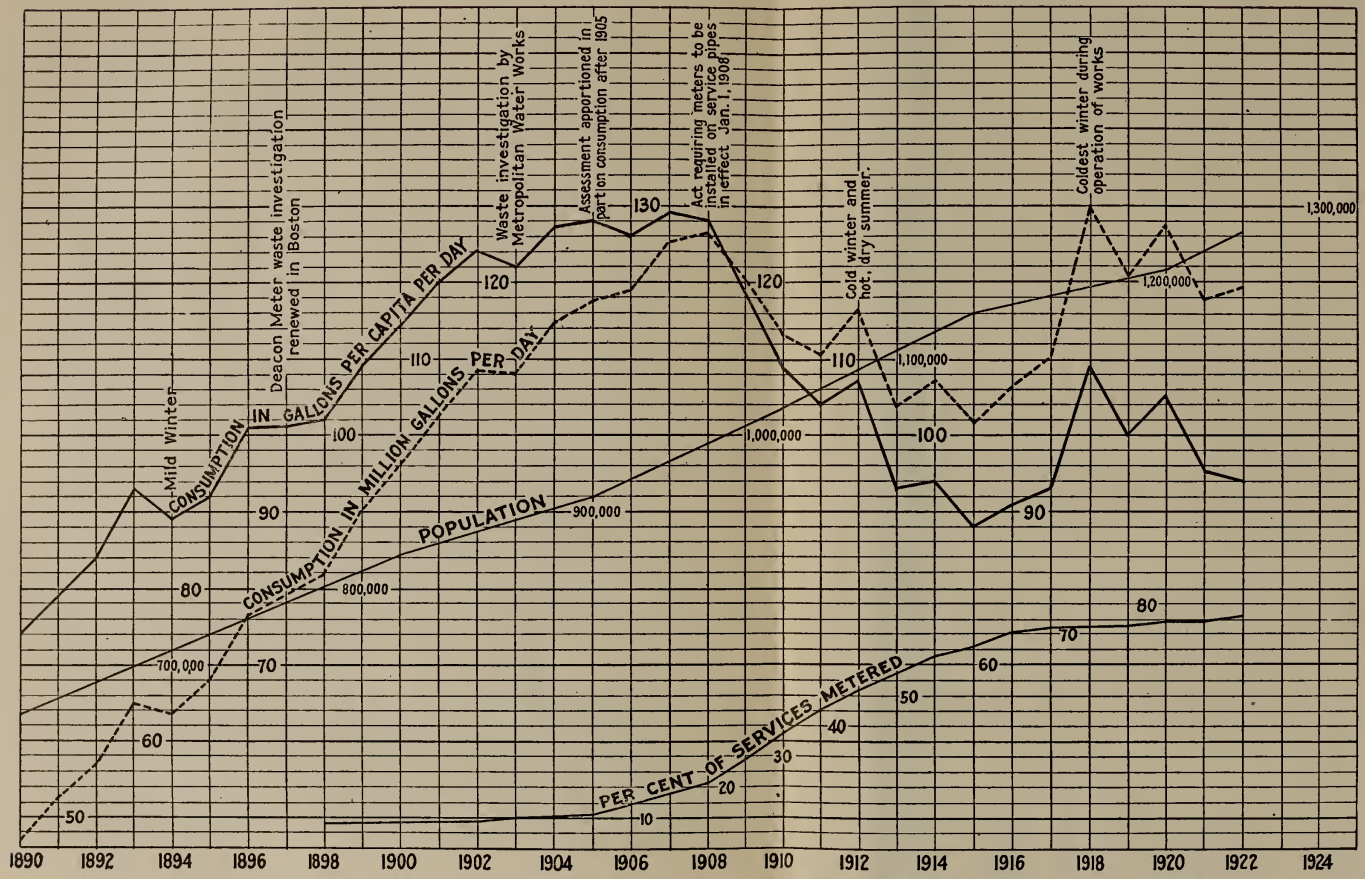
In May flagpoles were installed in the lawn in front of the garage at Chestnut Hill Reservoir and in front of the pumping station at Spot Pond. Both poles consist of mainmast, cross trees and topmast, making a total height above the ground of 85½ feet at Chestnut Hill Reservoir and 71 feet at Spot Pond.

The sidetrack at Chestnut Hill pipe yard and pumping stations was repaired by C. W. Dolloff & Co. between October 16 and November 6 at a cost of $3,972.88. Unsound ties were replaced with new ties cut on water works lands in the Wachusett Section and the old 60 pound rails were replaced with new 90 pound rails furnished by the Boston & Albany Railroad.

The exterior ironwork and woodwork of Chestnut Hill pumping station No. 1 was painted by the regular Water Division employees and at Chestnut Hill pumping station No. 2 the garage and the buildings and derrick at the pipe yard were painted by George E. Babcock of Medford, and the exterior ironwork and woodwork of the Spot Pond, Arlington and Hyde Park stations by A. C. Dunbar of Hyde Park.

POPULATION, CONSUMPTION OF WATER AND PER CENT OF SERVICES METERED IN THE METROPOLITAN WATER DISTRICT AS SUPPLIED IN 1922

FROM 1890 TO 1922



Note: Estimated population and consumption per capita given on diagram published in annual reports 1916 to 1919 inclusive have been revised and are here shown in accordance with 1920 census.

The alterations begun at the old Mystic pumping station in July, 1920, are now substantially completed. The garage and carpenter shop have been used since December 1 and the storage room on the third floor at the westerly end of the building is well filled with unused furniture and old reports and records which were removed from the Boston office to provide space for the Park Division offices.

Alterations at the large storage shed at Chestnut Hill pipe yard are in progress, and woodworking machinery has been purchased for the carpenter shop but has not yet been installed.

Distribution Pipe Lines.

The length of the distribution pipe lines owned and operated at the close of the year is 131.15 miles.

The pipe lines have been patrolled, and the work of municipalities, public service corporations and other parties in any way affecting the lines has been inspected. The valves, valve chambers and other appurtenances have been kept in good condition and salt was placed on covers of important valves to keep them free from ice during cold weather.

The pipe bridges at Chestnut Hill Avenue, Brighton, College Avenue, Medford and Adams Street, Milton, were repainted and repairs were made at the bridges over the Pines River in Revere and Saugus and over the Boston & Maine Railroad at Walnut Street and at Webster Avenue, in Somerville. The bridge at the latter place was constructed by the Boston & Maine Railroad in 1911 in connection with the elimination of the old grade crossing. It supports the Metropolitan Water Works 48-inch main and the city of Somerville 20-inch main. Repairs at this bridge were made by the Water Division as arranged by the Attorney General's office, with the understanding that the extent of the responsibility of the various parties concerned would be determined later. The work cost $1,057.95.

There are now 72 Venturi meters from 6 to 60 inches in diameter in the distribution pipe lines. Sixty-three of these, and 12 smaller Disc, Torrent and Detector meters, and 3 Union and 1 Crown meter owned by the town of Milton, and 1 Detector meter owned by the city of Malden, are regularly used for measuring the water supplied to the various cities and towns.

The nine pressure-regulating valves in the distribution mains for reducing the pressure of the water supplied to Nahant, Revere, Swampscott and Winthrop and to portions of Chelsea, East Boston and Hyde Park have given satisfactory service.

Recording pressure gages have been maintained at 21 stations on the distribution system and tables in the Appendix show the hydraulic grade at 18 of these stations as determined from the charts.

During the year five leaks at defective wooden insulating joints were repaired at a cost of $324.04, and 26 leaks at lead joints in cast-iron pipes, one leak in cement pipe and two leaks in kalomine pipe were repaired at a cost of $639.89.

A complete stock of pipes, specials and other materials and supplies required for maintaining and operating the pipe lines has been kept on hand at the Glenwood pipe yard in Medford and at the Chestnut Hill pipe yard in Brighton, and an auto truck equipped with a gate-operating attachment has been stationed at each yard with men on duty ready to operate them in case of emergency at any time during the day or night.

Consumption of Water.

During the year 43,532,488,000 gallons of water were furnished to the 18 cities and towns supplied in the Metropolitan Water District. This is equivalent to an average daily consumption of 119,267,100 gallons and for the estimated population of 1,266,050 is at the rate of 94 gallons per capita per day, and compared with the consumption in 1921 is a reduction of one gallon per capita or a little more than one per cent.

The population, consumption of water and per cent of services metered in the Metropolitan Water District as supplied in 1922, and for the period from 1890 to 1922, inclusive, are shown graphically by the accompanying diagram.

The average daily consumption of water in each of the municipalities in the Metropolitan Water District supplied during 1921 and 1922, as measured by the Metropolitan Water Works meters, is as follows: —

	Estimated Population, 1922.	Average Daily Consumption.				
		1921.		1922.		Increase in Gallons.
		Gallons.	Gallons per Capita.	Gallons.	Gallons per Capita.	
Arlington	19,630	1,100,300	57	1,059,600	54	40,700 [1]
Belmont	11,900	678,300	60	673,200	57	5,100 [1]
Boston	781,790	85,609,200	112	85,871,000	110	261,800
Chelsea	44,990	3,101,300	70	3,416,500	76	315,200
Everett	42,220	3,530,600	86	3,648,900	86	118,300
Lexington	6,690	441,700	68	440,000	66	1,700 [1]
Malden	51,350	2,468,700	49	2,698,000	53	229,300
Medford	42,800	1,853,900	45	2,193,400	51	339,500
Melrose	18,830	1,064,700	57	1,167,800	62	103,100
Milton	9,710	402,500	42	436,000	45	33,500
Nahant	1,440	182,100	132	172,300	120	9,800 [1]
Quincy	50,730	4,269,500	86	4,253,700	84	15,800 [1]
Revere	31,550	1,958,600	65	2,202,200	70	243,600
Somerville	97,090	6,919,400	73	7,357,300	76	437,900
Stoneham	8,060	610,400	76	523,200	65	87,200 [1]
Swampscott	8,550	718,800	86	629,800	74	89,000 [1]
Watertown	22,070	1,624,400	75	1,621,800	73	2,600 [1]
Winthrop	16,650	873,000	54	902,400	54	29,400
District	1,266,050	117,407,400	95	119,267,100	94	1,859,700

[1] Decrease.

The consumption by districts in 1922 as compared with 1921 is as follows: —

	Gallons per Day, 1922.	Increase from 1921.	
		Gallons per Day.	Percentage.
Southern low-service district, embracing the low-service district of Boston with the exception of Charlestown and East Boston	39,739,800	885,700	2.28
Northern low-service district, embracing the low-service districts of Arlington, Charlestown, Chelsea, East Boston, Everett, Malden, Medford and Somerville	26,158,600	1,320,200	5.31
Southern high-service district, embracing Quincy and Watertown, the high-service districts of Boston and portions of Belmont and Milton	41,855,000	791,100 [1]	1.86 [1]
Northern high-service district, embracing Melrose, Nahant, Revere, Stoneham, Swampscott and Winthrop and the high-service districts of Chelsea, East Boston, Everett, Malden, Medford and Somerville	9,624,900	316,500	3.40
Southern extra high-service district, embracing the higher portions of Hyde Park, Milton and West Roxbury	905,400	131,800	17.04
Northern extra high-service district, embracing Lexington and the higher portions of Arlington and Belmont	983,400	3,400 [1]	0.34 [1]
Totals	119,267,100	1,859,700	1.58

[1] Decrease.

During the year the city of Newton took water from the Metropolitan Works through the emergency connection on Ward Street near Hammond Street on four days in February and two days in May in testing its new emergency pumping plant. The total quantity of water taken was 5,557,000 gallons for which no compensation was paid as the water was taken in accordance with the agreement made in 1900 when the Waban Hill Reservoir was purchased from the city.

Installation of Meters on Service Pipes.

Information regarding the installation of meters on service pipes by the municipalities supplied with water from the Metropolitan Water Works is given in the accompanying table.

City or Town.	Services in use Dec. 31, 1907.	Services equipped with Meters Dec. 31, 1907.	Number of Meters required to be set on Old Services Each Year.	Old Services in use Dec. 31, 1922.	Old Services equipped with Meters Dec. 31, 1922.	Meters Set on Old Services 1908–1922, inclusive.	Number of Meters required to be set on Old Services 1908–1922, inclusive.	New Services installed and in use Dec. 31, 1922.[1]	New Services equipped with Meters Dec. 31, 1922.[1]	Total Services in use Dec. 31, 1922.	Total Services equipped with Meters Dec. 31, 1922.	Per Cent of Services metered Dec. 31, 1922.
Arlington	1,929	835	55	1,791	1,791	956	825	1,852	1,852	3,643	3,643	100.00
Belmont	792	792	–	751	751	–	–	1,512	1,512	2,263	2,263	100.00
Boston	93,942	5,190	4,276	90,329	60,552	55,362	55,384[2]	17,214	14,573	107,543	75,125	69.86
Chelsea	6,603	1,792	140	3,351[3]	3,328	2,341	2,100	2,013	2,005	5,364	5,333	99.42
Everett	5,161	116	252	5,152	3,890	3,774	3,780	1,068	1,068	6,220	4,958	79.71
Lexington	730	80	32	743	730	650	480	730	730	1,473	1,460	99.12
Malden	7,055	6,780	14	6,987	6,863	83	210	1,652	1,377	8,639	8,240	95.38
Medford	4,378	582	179	–[4]	–[4]	–[4]	2,685	–[4]	–[4]	–[4]	–[4]	–[4]
Melrose	3,429	1,058	119	3,428	3,428	2,370	1,785	992	980	4,420	4,408	99.73
Milton	1,285	1,285	–	1,247	1,247	–	–	1,196	1,196	2,443	2,443	100.00
Nahant	410	90	16	407	317	227	240	439	298	846	615	72.70
Quincy	6,091	1,480	230	5,856	5,266	3,786	3,450	5,956	5,394	11,812	10,660	90.25
Revere	2,875	158	138	2,840	2,035	1,877	2,070	2,335	2,335	5,175	4,370	84.44
Somerville	11,662	3,446	411	11,399	9,207	5,761	6,165	2,496	2,361	13,895	11,568	83.25
Stoneham	1,331	30	65	1,320	1,320	1,290	975	404	404	1,724	1,724	100.00
Swampscott	1,307	892	21	1,255	1,255	363	315	841	841	2,096	2,096	100.00
Watertown	1,886	1,886	–	1,886	1,886	–	–	1,740	1,740	3,626	3,626	100.00
Winthrop	2,074	70	100	2,033	2,019	1,949	1,500	1,070	1,070	3,103	3,089	99.55
Totals	152,940	26,562	6,048	–[4]	–[4]	–[4]	81,964	–[4]	–[4]	–[4]	–[4]	–[4]

[1] The number of new services installed and the number of new services equipped with meters do not always agree for the reason that service pipes are installed but meters are not set until the buildings are permanently occupied.

[2] Boston: Number of meters required to be set each year on old services, 4,438 for 1908, 1909 and 1910; reduced to 4,225 in 1911 on account of reduction in number of old services and increased to 4,276 after 1911 on account of unmetered services acquired by the annexation of Hyde Park. Boston exempt from setting meters on old services in 1917 and 1918. (Chapter 269, Special Acts of 1917, and Chapter 45, Special Acts of 1918.)

[3] Chelsea: 2,810 services destroyed during conflagration in April, 1908; 987 metered services remained after conflagration.

[4] Information for Medford not available.

Water Supplied Outside of Metropolitan Water District.

During the year 530,529,200 gallons of water were supplied from the Metropolitan Water Works for use outside the Metropolitan Water District, for which $11,266.32 was charged, as follows: —

Places supplied.	Total Quantity (Gallons).	Average Quantity (Gallons per Day).	Number of Days on which Water was supplied.	Amounts charged for Water supplied.
Westborough State Hospital	81,704,000	224,000	365	$2,451 12
Town of Framingham:				
From Sudbury Aqueduct	282,051,900	772,745	365	6,769 25
From filter-gallery at Farm Pond	139,550,300	382,330	365	267 63
United States government:				
Peddock's Island	17,579,000	48,200	365	1,240 67
Portion of town of Saugus	9,644,000	26,400	365	537 65

Additional information and statistics relating to the operation of the Metropolitan Water Works for the year 1922 are given in tables in the Appendix.

Respectfully submitted,

WILLIAM E. FOSS,
Director and Chief Engineer.

Boston, January 2, 1923.

REPORT OF DIRECTOR AND CHIEF ENGINEER OF SEWERAGE DIVISION.

JAMES A. BAILEY, *Commissioner, Metropolitan District Commission.*

DEAR SIR: — The following report of the operations of the Metropolitan Sewerage Works for the year ending December 31, 1922, is respectfully submitted: —

ORGANIZATION.

The Director and Chief Engineer has charge of the design and construction of all new works, and of the maintenance and operation of all the works controlled by the Metropolitan District Commission for removing sewage from the twenty-six municipalities which comprise the Metropolitan Sewerage Districts.

The following assistants have been employed during the year: —

Henry T. Stiff	Senior Assistant Engineer, in charge of office and drafting room and of the construction work.
Clarence A. Moore	Assistant Engineer, in charge of maintenance studies and records and of construction work on the North Metropolitan System.
Ralph W. Loud	Assistant Engineer, in charge of survey work and field work in connection with the Reading extension construction.
Thomas L. Whelan . . .	Superintendent, North Metropolitan Sewerage District.
Arthur F. F. Haskell . . .	Superintendent, South Metropolitan Sewerage District.

In addition to the above, the number of engineering and other assistants employed during the year was 8, which includes 1 instrumentman, 1 inspector, 1 draftsman, 3 rodmen and engineering assistants and 2 stenographers.

METROPOLITAN SEWERAGE DISTRICTS.

Areas and Populations.

During the year no changes have been made in the extent of the metropolitan sewerage districts.

The populations of the districts, as given in the following table, are based on the census of 1920.

Table showing Ultimate Contributing Areas and Present Estimated Populations within the Metropolitan Sewerage Districts, as of December 31, 1922.

	City or Town.	Area (Square Miles).		Estimated Population.	
North Metropolitan District.	Arlington	5.20		19,850	
	Belmont	4.66		12,160	
	Boston (portions of)	3.45		99,310	
	Cambridge	6.11		112,660	
	Chelsea	2.24		45,390	
	Everett	3.34		42,690	
	Lexington[1]	5.11		5,130	
	Malden	5.07		51,850	
	Medford	8.35		43,640	
	Melrose	3.73		18,970	
	Reading	9.82		7,800	
	Revere	5.86		32,160	
	Somerville	3.96		97,980	
	Stoneham	5.50		8,110	
	Wakefield	7.65		13,670	
	Winchester	5.95		10,940	
	Winthrop	1.61		16,910	
	Woburn	12.71		16,980	
			100.32		656,200
South Metropolitan District.	Boston (portions of)	24.96		279,410	
	Brookline	6.81		40,090	
	Dedham[1]	9.40		11,350	
	Milton	12.59		9,780	
	Newton	16.88		47,780	
	Quincy	12.56		51,360	
	Waltham	13.63		32,170	
	Watertown	4.04		22,200	
	Wellesley	9.89		6,810	
			110.76		500,950
	Totals		211.08		1,157,150

[1] Part of town.

METROPOLITAN SEWERS.

Sewers Purchased and Constructed and their Connections.

During the year there have been no metropolitan sewers built within the sewerage districts, so that there are now 118.113 miles of metropolitan sewers. Of this total, 9.642 miles of sewers, with the Quincy pumping station, have been purchased from cities and towns of the districts. The remaining 108.471 miles of sewers and other works have been constructed by the metropolitan boards.

The locations, lengths and sizes of these sewers are given in the following tables, together with other data referring to the public and special connections with the systems: —

North Metropolitan Sewerage System.

Location, Length and Sizes of Sewers, with Public and Special Connections.

City or Town.	Size of Sewers.	Length in Miles.	Public Connections, December 31, 1922.	Special Connections.	
				Character or Location of Connection.	Number in Operation.
Boston: —					
Deer Island	4′ 0″ to 9′ 0″	1.653	4	–	–
East Boston	9′ 0″ to 1′ 0″	5.467	25	Shoe factory	1
				Middlebrook Wool-combing Co.	1
				Navy Yard	9
Charlestown	6′ 7″×7′ 5″ to 1′0″	3.292	15	Private building	1
				Club House	1
Winthrop	9′ 0″	2.864	14	Fire department station	1
				Private building	1
				Bakery	1
				Rendering works	1
Chelsea	8′ 4″×9′ 2″ to 15″	5.230	14	Metropolitan Water Works blow-off	1
				Chelsea Water Works blow-offs	2
				Naval Hospital	1
				Metropolitan Water Works blow-off	1
				Cameron Appliance Co.	1
				Shultz-Goodwin Co.	1
Everett	8′ 2″×8′ 10″ to 4′ 8″×5′ 1″	2.925	8	Andrews-Wasgatt Co.	1
				National Metallic Bed Co.	1
				Linoide Co.	1
				Factory	2
				New England Structural Co.	1
Lexington	–	–	1	–	–
Malden	4′ 6″×4′ 10″ to 1′ 0″	5.844[1]	34	Metropolitan Water Works blow-off	1
				Private buildings	200[2]
				Private buildings	122[4]
Melrose	4′ 6″×4′ 10″ to 10″	6.099[3]	39	Factory	1
				Railroad station	1
				Park Department bath-house	1

[1] Includes 1.84 miles of sewer purchased from the city of Malden.

[2] Mostly buildings connected with sewers formerly belonging to city of Malden but later purchased by the Metropolitan Sewerage Commission in accordance with chapter 215 of the Acts of 1898 and by the Metropolitan Water and Sewerage Board in accordance with chapter 512 of the Acts of 1911 and made parts of the North Metropolitan Sewerage System.

[3] Includes .736 of a mile of sewer purchased from the city of Melrose.

[4] Mostly buildings connected with a sewer formerly belonging to the city of Melrose but later purchased by the Metropolitan Sewerage Commission in accordance with chapter 414 of the Acts of 1896 and with a sewer extension built in accordance with chapter 436 of the Acts of 1897 by the Metropolitan Sewerage Commission as an outlet for part of the town of Stoneham and made parts of the North Metropolitan Sewerage System.

NORTH METROPOLITAN SEWERAGE SYSTEM — *Concluded.*

Location, Length and Sizes of Sewers, with Public and Special Connections — Concluded.

City or Town.	Size of Sewers.	Length in Miles.	Public Connections, December 31, 1922.	Special Connections. Character or Location of Connection.	Special Connections. Number in Operation.
Cambridge	5′ 2″×5′ 9″ to 1′ 3″	7.209	45	Harvard dormitories	2
				Slaughter house	1
				City Hospital	3
				Street railway machine shop	1
				Private building	1
				Factory building	1
				Tannery	1
				Slaughterhouses (3)	1
				Carhouse	1
Somerville	6′ 5″×7′ 2″ to 10″	3.577	12	Somerville Water Works blow-off	1
				Street railway power house	1
				Stable	1
				Rendering works	1
				Railroad scale pit	1
				Private building	1
				Armory building	1
Medford	4′ 8″×5′ 1″ to 10″	5.713	26	Private buildings	9
				Stable	1
				Police substation	1
				Tanneries	6
				Private buildings	10
				Gelatine factory	1
				Watch-hand factory	1
Winchester	4′ 6″ to 1′ 3″	9.470	27	Stable	1
				Railroad station	2
				Felt works	1
				Town Hall	1
				Bay State Saw & Tool Co.	1
				Whitney Machine Co.	1
Stoneham	1′ 8″ to 10″	2.333	4	–	–
Woburn	1′ 10″×2′ 4″ to 1′ 3″	0.713	3	Glue factory	3
Arlington	1′ 6″ to 10″	3.520[1]	46	Private buildings	168[2]
				Railroad station	1
				Car-house	3
				Post office	1
Belmont[3]	–	–	3	–	–
Wakefield	3′ 0″ to 2′ 0″×2′ 3″	0.703	1	–	–
Revere	4′ 0″ to 15″	0.136	3	–	–
Reading	–	0.055	1	–	–
		66.803[4]	325		587

[1] Includes 2.631 miles of sewer purchased from the town of Arlington.

[2] Mostly buildings connected with a sewer formerly belonging to the town of Arlington but later purchased by the Metropolitan Sewerage Commission in accordance with chapter 520 of the Acts of 1897 and made a part of the North Metropolitan Sewerage System.

[3] The Metropolitan Sewer extends but a few feet into the town of Belmont.

[4] Includes 2.787 miles of Mystic valley sewer in Medford and Winchester, running parallel with the metropolitan sewer.

SOUTH METROPOLITAN SEWERAGE SYSTEM.

Location, Length and Sizes of Sewers, with Public and Special Connections.

City or Town.	Size of Sewers.	Length in Miles.	Public Connections, December 31, 1922.	Special Connections. Character or Location of Connection.	Special Connections. Number in Operation.
Boston: —				Tufts Medical School	1
				Private house	1
Back Bay	6′ 6″ to 3′ 9″	1.500[1]	16	Administration Building, Boston Park Department	1
				Simmons College Buildings	1
				Art Museum	2
				Prince District Elementary School	1
Brighton	5′ 9″×6′ 0″ to 12″	6.010[2]	15	Abattoir	3
				Chocolate works	2
				Machine shop	1
Dorchester	3′×4′ to 2′ 6″×2′ 7″	2.870[3]	13	Paper Mill	1
				Private buildings	3
				Edison Electric Company Station	1
				Mattapan Paper Mills	2
Hyde Park	10′ 7″×11′ 7″ to 4′ 0″×4′ 1″	4.527	18	Private buildings	2
				Fairview Cemetery Buildings	1
Roxbury	6′ 6″×7′ to 4′ 0″	1.430	–	–	–
				Caledonia Grove buildings	1
West Roxbury	9′ 3″×10′ 2″ to 12″	7.643	17	Parental School	1
				Lutheran Evangelical Church	1
				Private buildings	4
Brookline	6′ 6″×7′ 0″ to 8″	2.540[4]	12	Private buildings	2
Dedham	4′×4′ 1″ to 2′ 9″×3′	5.012	7	Dedham Carpet Mills	1
Hull[5]	60″ pipe	0.750	–	–	–
Milton	11′×12′ to 8″	3.600	23	Private buildings	2
Newton	4′ 2″×4′ 9″ to 1′ 3″	2.911	8	Private houses	7
				Metropolitan Water Works blow-off	1
Quincy	11′ 3″×12′ 6″ to 24″ pipe	6.845	15	Squantum schoolhouse	1
Waltham	3′ 6″×4′ 0″	0.001	1	–	–
				Factories	2
Watertown	4′ 2″×4′ 9″ to 12″	0.750[6]	7	Stanley Motor Carriage Co.	1
				Knights of Pythias building	1
Needham[5]	2′ 0″×2′ 3″ to 2′ 3″×2′ 6″	4.921	–	–	–
Wellesley[7]	–	–	1	–	–
		51.310	153		48

[1] Includes .355 of a mile of sewer purchased from the city of Boston.
[2] Includes .446 of a mile of pipe and concrete sewers built for the use of the city of Boston; also .026 of a mile of sewer purchased from the town of Watertown.
[3] Includes 1.24 miles of sewer purchased from the city of Boston.
[4] Includes .158 of a mile of pipe sewer built for the use of the town of Brookline.
[5] Hull and Needham are not parts of the Metropolitan Sewerage District.
[6] Includes .025 of a mile of sewer purchased from the town of Watertown.
[7] The metropolitan sewer extends but a few feet into the town of Wellesley.

Information relating to areas, populations, local sewer connections and other data for the metropolitan sewerage districts appears in the following table: —

North Metropolitan Sewerage District.

Area (Square Miles).	Estimated Total Population.	Miles of Local Sewer connected.	Estimated Population contributing Sewage.	Ratio of Contributing Population to Total Population (Per Cent.).	Connections made with Metropolitan Sewers.	
					Public.	Special.
100.32	656,200	812.54	602,780	91.9	325	587

South Metropolitan Sewerage District.

110.76	500,950	712.08	387,840	77.4	153	48

Both Metropolitan Sewerage Districts.

211.08	1,157,150	1,524.62	990,620	85.6	478	635

Of the estimated gross population of 1,157,150 on December 31, 1922, 990,620 representing 85.6 per cent, were on that date contributing sewage to the metropolitan sewers, through a total length of 1,524.62 miles of local sewers owned by the individual cities and towns of the districts.

These sewers are connected with the metropolitan systems by 478 public and 635 special connections. During the current year there has been an increase of 21.41 miles of local sewers connected with the metropolitan systems, and 5 public and 15 special connections have been added.

CONSTRUCTION.

NORTH METROPOLITAN SEWERAGE SYSTEM.

New Mystic Sewer.

At the time of the extension of the Metropolitan Sewerage System to Reading, a line was built from Hill Street, Woburn, northerly to the Reading town line. Chapter 529 of the Acts of 1922 authorized the extension of this line from Hill Street southerly to a point in Winchester near the Boston and Maine Railroad for which an appropriation of one hundred and fifty thousand dollars ($150,000) was made. This line has a total length of about 7,800 feet and will have a capacity of about 7,000,000 gallons per day and will later serve as an outlet for a part of Woburn which will soon require sewerage facilities. The funds for this work did not become available until near the middle of September, 1922. Since this date surveys have been made over this route and maps prepared. No contracts for construction work have yet been entered into.

SOUTH METROPOLITAN SEWERAGE SYSTEM.

Quincy Pumping Station and Force Main.

An appropriation of seventy-five thousand dollars ($75,000) was made by chapter 529 of the Acts of 1922 for the construction of a new 30-inch cast-iron force main from the Quincy Pumping Station to the junction of Putnam and Greenleaf Streets in Quincy; also for the installation of a new pumping unit at the Quincy Pumping Station. Surveys have been made over the route of this force main and maps have been prepared. A contract for furnishing the 30-inch cast-iron pipe and specials was made with the Warren Foundry and Pipe Company dated October 19, 1922. Most of these pipes have been delivered. No contract for construction work has yet been entered into.

MAINTENANCE.

SCOPE OF WORK AND FORCE EMPLOYED.

The maintenance of the Metropolitan Sewerage System includes the operation of 8 pumping stations, the Nut Island screenhouse and 118.113 miles of Metropolitan sewers, receiving the discharge from 1,524.62 miles of town and city sewers at 478 points, together with the care and study of inverted siphons under streams and in the harbor.

At present the permanent maintenance force consists of 175 men, of whom 108 are employed on the North System and 67 on the South System. These are subdivided as follows: North Metropolitan System, 63 engineers and other employees in the pumping stations, and 45 men, including foremen, on maintenance, care of sewer lines, buildings and grounds; South Metropolitan System, 38 engineers and other employees in the pumping stations and 29 men, including foremen, on maintenance, care of sewer lines, buildings and grounds.

The regular work of this department, in addition to the operation of the pumping stations, has consisted of routine work of cleaning and inspecting sewers and siphons, caring for tide gates, regulators and overflows, measuring flow in sewers, inspection of connections to the Metropolitan sewers, and the care of pumping stations and other buildings and grounds.

In addition to these regular duties other work has been done by the maintenance employees of this department as follows:

Deer Island Pumping Station.

The gases from the screen house had so badly corroded the copper flashings and roof coverings that it became necessary to strip the old metal and replace the same on the roofs of the screen-house and coal pocket.

Repairs were also made on the copper gutters of the pumping station buildings. This work was done by a firm of sheet metal workers and was paid for by day labor.

Pump No. 3 at this station received extensive repairs during the year. These consisted of a new 10-inch shaft with a new brass sleeve and the connecting of the same with the old shaft by means of a crucible steel sleeve coupling.

The old pile wharf at Deer Island constructed in 1892 is in bad condition. An inspection of the under water part of the piles was made by diver and they were found to be in bad condition owing to attacks of limnoria. Some of them were eaten entirely away.

East Boston Pumping Station.

Vulcan Soot Cleaners were installed on the six vertical boilers at this station.

The skylights over the boiler room at this station had become so badly corroded by gases that it was necessary to rebuild the same. This work was done by a firm of sheet metal workers by day labor.

The concrete retaining wall situated on the northerly side of the East Boston stock yard had become so badly eaten away by the tidal water that it became necessary to build a new wall at this place.

The intake pipes for the sea-water condensing supply for the engines in this station were inspected and cleaned by a diver.

Repairs were made on pump No. 3 consisting of a new quarter box housing at the lower bearing and a new bronze sleeve for the 10-inch shaft.

A new building for the storage of supplies has been constructed in the maintenance yard.

The upper portion of the north chimney at this station constructed in 1894 had become weathered to such an extent that it became necessary to make repairs. A contract for this work was made with the Boston Lightning Rod Company. These repairs consist of renewing the bolts in the cast-iron cap at the top of the chimney, putting new points on the lightning rod and pointing the masonry joints in the chimney both within and without in its upper portion.

Charlestown Pumping Station.

The low pressure cylinder of engine No. 1 had long been cracked although usable. This became gradually worse and it was necessary to strip the cylinder and repair the same by patching. The low pressure piston was also refitted.

The timber work which carries the coal run at this station had become so badly rotted near the ground that it was necessary to renew it.

A Morton Vacuum Breaker was installed on engine No. 3 at this station.

Alewife Brook Pumping Station.

A lathe was installed at this station so that repairs can be made by the mechanics in the station.

Maintenance Yard at Winchester.

For many years the maintenance yard of the Winchester Division of the North Metropolitan Sewerage District has been located in land belonging to the town of Winchester. This has been occupied without any payment therefor. The town of Winchester informed us that it was their intention to make use of all of their land and it was necessary for us to seek new quarters. Accordingly land for a maintenance yard was purchased in Winchester from the Moore Securities Company at a cost of one thousand dollars. This land is situated on the southerly side of Cross Street immediately west of the Boston and Maine Railroad location. A fence and buildings will be constructed on this yard in the coming season.

Ward Street Pumping Station.

Vulcan Soot Cleaners were installed on the six vertical boilers at this station.

The walls of the building which enclose the economizer were extended upward for a distance of about ten feet. A concrete roof was placed over the same. This extension was made to enable repair work to be done around the economizer.

Quincy Pumping Station.

The cast-iron cross head of engine No. 2 at this station broke while in service. It was replaced by a new one made of crucible steel.

St. Mary's Street Tide Gates.

The tide gates at St. Mary's Street, Boston, which control the overflow of the Brookline sewer into the Charles River Basin had become so badly rotted that it was necessary to replace them. There are two sets of gates at this place. The inner set only were renewed.

Gasolene in Public Sewers.

The efforts to improve the condition of the Metropolitan sewers in regard to dangers resulting from the introduction of gasolene into the same have been continued throughout the year and have been successful.

An inspector has been employed in this department whose duty it is to visit existing garages and see that the separators are kept in proper condition, also to enforce the regulation concerning the installation of such separators at all newly constructed garages.

At the request of the Metropolitan District Commission the Department of Public Safety has made an effort to assist in the protection of the Metropolitan sewers from gasolene. A set of regulations concerning garages and their appurtenances has been published by them, and they have recognized the fact that by statute they are charged with the supervision and control of the effluent from these establishments which is discharged into the sewers.

During the year 93 new garages and other establishments using gasolene have been connected with the local sewer systems which discharge into the Metropolitan sewers. At present there are 1,086 such connections.

North Metropolitan Sewerage System.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Populations estimated as of December 31, 1922.]

Cities and Towns.	Miles of Local Sewers connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House Connection.[1]	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Sq. Miles.	Sq. Miles.	Per Cent.	Per Cent.
Boston (Deer Island)	9.70	Separate	–	–	440[2]	440	–	–	–	–
Winthrop	32.80	Separate	3,175	5.25	16,670	16,910	1.40	1.61	98.6	87.0
Boston (East Boston)	34.06	Separate and combined	5,187	12.1	62,760	63,320	1.17	2.18	99.1	53.7
Chelsea	31.77	Separate and combined	4,390	10.1	44,340	45,390	1.17	2.24	97.7	52.2
Everett	49.06	Separate and combined	5,285	7.2	38,050	42,690	2.05	3.34	89.1	61.4
Malden	68.45	Separate	7,559	6.5	49,130	51,850	3.18	5.07	94.8	62.7
Melrose	40.67	Separate	3,559	4.6	16,370	18,970	1.94	3.73	86.3	52.0
Boston (Charlestown)	21.76	Separate and combined	5,490	6.45	35,410	35,550	0.67	1.27	99.6	52.8
Cambridge	158.51	Separate and combined	17,217	6.5	111,910	112,660	5.05	6.11	99.3	82.7
Somerville	102.47	Separate and combined	16,407	5.9	96,800	97,980	3.53	3.96	98.8	89.1
Medford	68.90	Separate	6,788	6.3	42,760	43,640	3.41	8.35	98.0	40.8
Winchester	34.15	Separate	2,145	5.05	10,830	10,940	1.68	5.95	99.0	28.2
Woburn	18.20[3]	Separate	1,375	5.6	7,700	16,980	1.06	12.71	45.3	8.3
Stoneham	13.66	Separate	1,050	4.7	4,930	8,110	0.73	5.50	60.8	13.3
Arlington	35.68	Separate	2,899	6.0	17,390	19,850	2.09	5.20	87.6	40.2
Belmont	24.56	Separate	1,617	6.4	10,880[4]	12,160	1.41	4.66	89.5	30.3
Wakefield	15.46	Separate	965	5.3	5,110	13,670	0.65	7.65	37.4	8.5
Lexington	7.04	Separate	191	4.5	860	5,130	0.26	5.11	16.8	5.1
Revere	46.71	Separate	4,066	7.1	28,840	32,160	2.26	5.86	89.7	38.6
Reading	7.93	Separate	399	4.0	1,600	7,800	0.37	9.82	20.5	3.8
Totals	812.54	–	89,764	6.7	602,780	656,200	34.08	100.32	91.9	34.0

[1] Estimated from assessors' statement of the number of houses in each city or town on April 1, 1922, and the population from census of 1920.
[2] Estimated by Superintendent of the institution on Deer Island.
[3] Includes 1.15 miles of old Mystic Valley Sewer now owned by city of Woburn and as a local sewer.
[4] Including 2 connections with McLean Hospital, having an estimated population of 526.

South Metropolitan Sewerage System.

Table showing Cities and Towns delivering Sewage to this Sytem; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Populations estimated as of December 31, 1922.]

Cities and Towns.	Miles of Local Sewers connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House Connection.[1]	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Sq. Miles.	Sq. Miles.	Per Cent.	Per Cent.
Boston (Back Bay)	26.96	Separate and combined	1,950	17.45	34,030	34,170	1.15	1.61	99.6	71.4
Boston (Brighton)	65.96	Separate and combined	4,286	10.4	44,570	44,790	3.27	3.74	99.5	87.4
Brookline	75.62	Separate and combined	5,348	7.45	39,840	40,090	3.66	6.81	99.4	53.7
Newton	137.51	Separate	8,556	5.35	45,770	47,780	8.19	16.88	95.8	48.5
Watertown	49.26	Separate	3,309	6.65	22,000	22,200	2.41	4.04	99.1	59.7
Waltham	47.61	Separate	4,095	7.65	31,330	32,170	2.49	13.63	97.4	18.3
Boston (Dorchester)	61.24	Separate and combined	6,196	9.5	58,860[2]	88,500[2]	2.68	4.89	66.5[2]	54.8
Milton	19.21	Separate and combined	1,278	4.8	6,130[2]	9,780[2]	1.03	12.59	62.7[2]	8.2
Boston (Hyde Park)	36.41	Separate	2,568	7.4	19,000	19,350	1.70	4.57	98.2	37.2
Dedham	17.90	Separate	975	5.6	5,460	11,350[3]	0.90	9.40	48.1	9.6
Boston (Roxbury)[4]	–	–	–	–	–	48,250[2]	–	1.23	–	–
Boston (West Roxbury)	63.88	Separate and combined	4,414	6.8	32,410[2,5]	44,350[2]	2.85	8.92	73.1[2]	32.0
Quincy	92.51	Separate	7,718	6.0	46,310	51,360	3.80	12.56	90.2	30.3
Wellesley	18.01	Separate	533	4.0	2,130	6,810	0.90	9.89	31.3	9.1
Totals	712.08	–	51,226	7.6	387,840	500,950	35.03	110.76	77.4	31.6

[1] Estimated from assessors' statement of the number of houses in each city or town on April 1, 1922, and the population from census of 1920.
[2] Parts of Dorchester, Milton, Roxbury and West Roxbury which are situated within the South Metropolitan Sewerage System limits are tributary at present to Boston main drainage works.
[3] Part of town not included in Metropolitan Sewerage District.
[4] At present connected with Boston main drainage system.
[5] Including connection with institutions at Austin Farm, having an estimated population of 2,394.

Both Metropolitan Sewerage Systems.

Table showing Areas delivering Sewage to both Systems; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Populations estimated as of December 31, 1922.]

System.	Miles of Local Sewers connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House Connection.	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ratio of Contributing Area to Ultimate Area.
							Sq. Miles.	Sq. Miles.	Per Cent.	Per Cent.
North Metropolitan . .	812.54	Separate and combined .	89,764	6.7	602,780	656,200	34.08	100.32	91.9	34.0
South Metropolitan . .	712.08	Separate and combined .	51,226	7.6	387,840	500,950	35.03	110.76	77.4	31.6
Totals	1,524.62	– –	140,990	7.0	990,620	1,157,150	69.11	211.08	85.6	32.7

PUMPING STATIONS.

Capacities and Results.

North Metropolitan System.

Deer Island Pumping Station.

At this station are four submerged centrifugal pumps with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons, with 19-foot lift.
Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.
Average duty for the year: 53,000,000 foot pounds.
Average quantity raised each day: 73,200,000 gallons.
Maximum quantity raised per day: 151,800,000 gallons.

East Boston Pumping Station.

At this station are four submerged centrifugal pumps, with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons with 19-foot lift.
Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.
Average duty for the year: 77,400,000 foot pounds.
Average quantity raised each day: 71,200,000 gallons.
Maximum quantity raised per day: 149,800,000 gallons.

Charlestown Pumping Station.

At this station are three submerged centrifugal pumps, two of them having impeller wheels 7.5 feet in diameter, the other 8.25 feet in diameter. They are driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 60,000,000 gallons with 8-foot lift.
Contract capacity of 2 pumps: 22,000,000 gallons each, with 11-foot lift.
Average duty for the year: 47,400,000 foot pounds.
Average quantity raised each day: 39,900,000 gallons.
Maximum quantity raised per day: 73,900,000 gallons.

Alewife Brook Pumping Station.

The plant at this station consists of two 9-inch Andrews commercial centrifugal pumps, direct connected by horizontal shafts to compound marine engines, together with a pump and engine added later. The latter consists of a specially designed engine of the vertical cross-compound type, having between the cylinders a centrifugal pump rotating on a horizontal axis.

Contract capacity of the 2 original pumps: 4,500,000 gallons each, with 13-foot lift.
Contract capacity of new pump: 13,000,000 gallons, with 13-foot lift.
Average duty for the year: 21,300,000 foot pounds.
Average quantity raised each day: 5,056,000 gallons.
Maximum quantity raised per day: 12,980,000 gallons.

Reading Pumping Station.

At this station are two submerged centrifugal pumps, of 2,500,000 gallons per 24 hours, and 4,000,000 gallons per 24 hours, capacity. These operate against a maximum head of 65 feet, and are actuated by vertical shafts directly connected with 75 and 100 horsepower motors. Alternating current of 440 volts furnished by the municipal plant of the town of Reading is used.

Average quantity pumped per 24 hours: 760,000 gallons.
Maximum quantity raised per day: 1,530,000 gallons.

South Metropolitan System.

Ward Street Pumping Station.

At this station are two vertical, triple-expansion pumping engines, of the Allis-Chalmers type, operating reciprocating pumps, the plungers of which are 48 inches in diameter with a 60-inch stroke.

Contract capacity of 2 pumps: 50,000,000 gallons each, with 45-foot lift.
Average duty for the year: 81,644,000 foot pounds.
Average quantity raised each day: 34,555,000 gallons.
Maximum quantity raised per day: 62,357,000 gallons.

Quincy Pumping Station.

At this station are two compound condensing Deane pumping engines and one Lawrence centrifugal pump driven by a Sturtevant compound condensing engine.

Contract capacity of 3 pumps: Deane, 3,000,000 gallons: Deane, 5,000,000 gallons; Lawrence centrifugal, 10,000,000 gallons.
Average duty for the year: 32,700,000 foot pounds.
Average quantity raised each day: 5,416,000 gallons.
Maximum quantity raised per day: 14,821,000 gallons.

Nut Island Screen House.

The plant at this house includes two sets of screens in duplicate actuated by small reversing engines of the Fitchburg type. Two vertical Dean boilers, 80 horse power each, operate the engines, provide heat and light for the house, burn materials intercepted at the screens, and furnish power for the Quincy (Hough's Neck) sewage lifting station.

Average daily quantity of sewage passing screens: 65,100,000 gallons.
Maximum quantity passing screens per day: 166,000,000 gallons.

Quincy (Hough's Neck) Sewage Lifting Station.

At this station are two 6-inch submerged Lawrence centrifugal pumps with vertical shafts actuated by two Sturtevant direct-current motors.

The labor and electric energy for this station are supplied from the Nut Island Screen House, and as used at present it does not materially increase the amount of coal used at the latter station.

Average quantity raised each day: 244,400 gallons.
Maximum quantity raised per day: 540,700 gallons.

Average Daily Volume of Sewage lifted at Each of the Seven Principal Metropolitan Sewerage Pumping Stations and at the Quincy (Hough's Neck) Sewage Lifting Station during the Year, as compared with the Corresponding Volumes for the Previous Year.

Pumping Station.	Average Daily Pumpage.			
	Jan. 1, 1922, to Dec. 31, 1922.	Jan. 1, 1921, to Dec. 31, 1921.	Increase during the Year.	
	Gallons.	Gallons.	Gallons.	Per Cent.
Deer Island	73,200,000	68,600,000	4,600,000	6.7
East Boston	71,200,000	66,600,000	4,600,000	6.9
Charlestown	39,900,000	38,900,000	1,000,000	2.6
Alewife Brook	5,056,000	4,591,000	465,000	10.1
Reading	760,000 [1]	–	–	–
Quincy	5,416,000	5,776,000	360,000 [2]	6.2 [2]
Ward Street (actual gallons pumped)	34,666,000	33,333,000	1,333,000	4.0
Quincy (Hough's Neck) sewage lifting station	244,400	224,300	20,100	9.0

[1] Station opened Dec. 7, 1921. [2] Decrease.

Metropolitan Sewerage Outfalls.

The metropolitan Sewerage Districts now have outfalls in Boston Harbor at five points, two of which may discharge sewage from the North District and three from the South District.

An inspection was made of these outfalls by a diver. The Deer Island Outfall was found to be in good condition except that some of the openings were closed up by an accumulation of grease. This was removed. The outfalls in the South System were found to be in good condition and free from all obstructions.

During the year the sewage of the North District has been discharged wholly through the outlet located near Deer Island light. The other outfall of this system is closed by a cast-iron cover which can be easily removed.

Of the outfalls of the South District two extend for a distance exceeding one mile from the shore of Nut Island, Quincy, and the third one, called an emergency outlet, extends about 1,500 feet from the same. No discharge was made through the emergency outlet during the year.

During the year the average flow through the North Metropolitan District outfall at Deer Island has been 73,200,000 gallons of sewage per 24 hours, with a maximum rate of 151,800,000 gallons during an exceptionally stormy period in May, 1922. The amount of sewage discharged in the North Metropolitan District averaged 121 gallons per day for each person, taking the estimated population of the District contributing sewage. If the sewers in this district were restricted to the admission of sewage proper only, this per capita amount would be considerably decreased.

In the South Metropolitan District an average of 65,100,000 gallons of sewage has passed daily through the screens at the Nut Island Screen House, and has been discharged from the outfalls into the outer harbor. The maximum rate of discharge per day which occurred during an exceptionally stormy period in May, 1922, was 166,000,000 gallons. The discharge of sewage through these outfalls represents the amount of sewage contributed by the South Metropolitan District, which was at the rate of 168 gallons per day per person of the estimated number contributing sewage in the District.

The daily discharge of sewage per capita is considerably larger in the South Metropolitan District than it is in the North Metropolitan District, because, owing to the large size and unused capacity of the South District High-level Sewer, more storm water is at present admitted to the sewers of this District.

Material Intercepted at the Screens.

The material removed from the sewage at the screens of the North Metropolitan Sewerage Stations, consisting of rags, paper and other floating materials, has during the year amounted to 1,312.9 cubic yards. This is equivalent to 1.33 cubic feet for each million gallons of sewage pumped at Deer Island.

The material removed from the sewage at the screens of the South Metropolitan Sewerage Stations has amounted to 3,255.6 cubic yards, equal to 3.70 cubic feet per million gallons of sewage delivered at the outfall works at Nut Island.

Studies of sewage flows in the Metropolitan sewers and siphons indicate that they are free from deposit.

FREDERICK D. SMITH,
Director and Chief Engineer of Sewerage Division.

Boston, January 1, 1923.

FINANCIAL STATEMENT.

PARKS DIVISION.

Loan Funds.	Total of Loans and Receipts.	Expended for Year ending Jan. 1, 1923.	Total Expended to Jan. 1, 1923.	Balance.
Metropolitan Parks Loan	$9,291,986 77	$13,855 00	$9,261,799 23	$30,187 54
Metropolitan Parks Loan, Series II	7,580,123 82	111,298 16	6,773,806 15	806,317 67
North Beacon Street Bridge Loan	175,000 00	–	174,853 50	146 50
Charles River Basin Loan	4,509,368 91	–	4,472,802 22	36,566 69
Charles River Bridges Loan	1,475,000 00	2,338 23	3,022 76	1,471,977 24

Maintenance Expenditures, Jan. 1, 1922, to Jan. 1, 1923.

		Totals.
Metropolitan Parks Maintenance Fund, General:		
General expense	$237,471 09	
Blue Hills Reservation	99,671 71	
Stony Brook Reservation	11,430 84	
Neponset River Reservation	827 89	
Quincy Shore Reservation	10,681 94	
Middlesex Fells Reservation	89,418 03	
Mystic River Reservation	17,407 38	
Revere Beach Reservation	54,265 61	
Lynn Shore Reservation	22,843 26	
Winthrop Shore Reservation	6,768 56	
Beaver Brook Reservation	3,371 88	
Charles River Upper Division	65,767 32	
Riverside Recreation Grounds	6,235 71	
Pensions	13,312 51	
		$639,473 73
Metropolitan Parks Maintenance Fund, Specials:		
Band concerts		19,531 55
Sanitary and garage, Charles River Upper Division		18,702 32
Widening Cradock Bridge		4,617 44
Clearing woods		54,971 92
Magazine Beach sanitary		7,361 50
Bacon St. Bridge		5,000 00
Metropolitan Parks Maintenance Fund, Cambridge Parkway		49,141 64
Metropolitan Parks Maintenance Fund — Boulevards, General:		
General expense	$114,616 81	
Blue Hills Parkway	22,858 50	
Neponset River Parkway	1,317 50	
Furnace Brook Parkway	10,322 57	
Hammond Pond Parkway	3,798 03	
West Roxbury Parkway	1,554 12	
Middlesex Fells Parkway	45,021 45	
Mystic Valley Parkway	35,690 70	
Lynn Fells Parkway	5,316 50	
Middlesex Fells Roads	14,034 17	
Alewife Brook Parkway	16,855 99	
Woburn Parkway	6,506 87	
Revere Beach Parkway	57,521 86	
Nahant Beach Parkway	9,373 31	
Winthrop Parkway	919 30	
Lynnway	11,017 60	
Fresh Pond Parkway	2,493 70	
Neponset River Bridge	12,596 66	
		371,815 64

	Totals.
Metropolitan Parks Maintenance Fund — Boulevards, Specials:	
West Roxbury Parkway	$13,610 95
Mystic Valley Parkway	39,922 77
Quincy Shore improvements	17,394 54
Retaining wall, Everett	1,571 71
Road building machinery	4,605 93
Reconstruction of Saugus River Bridge	40,418 15
Winthrop Parkway	164,128 39
Charles River Basin Maintenance	173,602 97
Metropolitan Parks Maintenance Fund, Nantasket	67,960 71
Metropolitan Parks Maintenance Fund, Wellington Bridge	14,459 54
Bunker Hill Maintenance	8,302 16
Bunker Hill, Special improvements	6,341 42
Metropolitan Parks Expense Fund:	
Receipts, Jan. 1, 1922, to Jan. 1, 1923	$149,842 40
Expenditures, Jan. 1, 1922, to Jan. 1, 1923	140,564 55
Balance	$9,277 85

WATER AND SEWERAGE DIVISIONS.

The financial abstract of the receipts, disbursements, assets and liabilities of the Metropolitan District Commission, Water and Sewerage Divisions, for the State fiscal year, beginning with December 1, 1921, and ending with November 30, 1922, was, in accordance with the requirements of section 100, chapter 92 of the General Laws, presented to the General Court in January last, and a copy of this financial abstract is printed as Appendix No. 3.

As required by said section a detailed statement of its doings for the calendar year 1922, in relation to the Metropolitan Water and Sewerage Works, is herewith presented.

WATER WORKS. — CONSTRUCTION.

(1) Water Loans — Receipts and Payments.

Total loans authorized to January 1, 1923		$45,685,000 00
Receipts from the sales of property applicable to the construction and acquisition of works:		
For the period prior to January 1, 1922	$274,135 85	
For the year ending December 31, 1922	2,903 09	
		277,038 94
Receipt from the town of Swampscott for admission to district (St. 1909, c. 320)		90,000 00
Total amount authorized to January 1, 1922		$46,052,038 94
Amounts approved by Board for payments out of Water Loan Fund:		
Payments prior to January 1, 1922	$43,444,605 28	
Approved for year ending December 31, 1922	332,974 17	
		43,777,579 45
Amount authorized but not expended January 1, 1923		$2,274,459 49

(2) Total Water Debt, December 31, 1922.

Water Loan Outstanding, Sinking Fund and Debt.

Bonds issued by the Treasurer of the Commonwealth:		
Sinking fund bonds (3 and 3½ per cent)		$41,398,000 00
Serial bonds (3½, 4 and 4¼ per cent)		2,049,000 00
Total bond issue to December 31, 1922		$43,447,000 00
Serial bonds paid prior to January 1, 1922	$265,000 00	
Serial bonds paid in 1922	44,000 00	
		309,000 00
Total bond issue outstanding December 31, 1922		$43,138,000 00
Gross water debt		$43,138,000 00
Sinking fund December 31, 1922		19,230,940 55
Net water debt December 31, 1922		$23,907,059 45

A decrease for the year of $627,926.34.

(3) Metropolitan Water Loan and Sinking Fund, December 31, 1922.

Year.	Authorized Loans.	Bonds issued (Sinking Fund).	Bonds issued (Serial Bonds).	Sinking Fund.
1895	$27,000,000	$5,000,000	–	$226,286 05
1896	–	2,000,000	–	699,860 70
1897	–	6,000,000	–	954,469 00
1898	–	4,000,000	–	1,416,374 29
1899	–	3,000,000	–	1,349,332 97
1900	–	1,000,000	–	1,573,619 72
1901	13,000,000	10,000,000	–	1,662,426 95
1902	–	3,500,000	–	2,256,803 81
1903	–	1,500,000	–	2,877,835 59
1904	–	2,500,000	–	3,519,602 92
1905	–	650,000	–	4,207,045 69
1906	500,000	1,350,000	–	4,897,822 62
1907	–	–	–	5,643,575 69
1908	398,000	–	–	6,419,283 28
1909	900,000	398,000	–	7,226,262 31
1910	80,000	500,000	–	8,089,902 91
1911	212,000	–	$200,000	8,953,437 44
1912	600,000	–	190,000	9,829,356 80
1913	108,000	–	–	10,767,701 68
1914	–	–	258,000	11,533,453 45
1915	–	–	490,000	12,491,245 25
1916	–	–	66,000	13,268,199 36
1917	–	–	150,000	14,036,278 88
1918	115,000	–	–	14,870,834 84
1919	67,000	–	161,000	15,904,545 14
1920	2,705,000	–	34,000	16,953,165 15
1921	–	–	–	18,147,014 21
1922	–	–	500,000	19,230,940 55
	$45,685,000	$41,398,000	$2,049,000	–

(4) Water Assessment, 1922.

The following water assessment was made by the Treasurer of the Commonwealth upon the various municipalities: —

Sinking fund requirements		$210,504 77
Serial bonds	$57,000 00	
Less premium	8,105 01	
		48,894 99
Interest		1,466,977 83
Maintenance:		
Appropriated by Legislature	$784,800 00	
Less balance on hand	84,055 96	
		700,744 04
Total water assessment for 1922		$2,427,121 63

In accordance with section 26, chapter 92 of the General Laws, the proportion to be paid by each city and town is based one-third in proportion to their respective valuations and the remaining two-thirds in proportion to their respective water consumption for the preceding year, except that but one-fifth of the total valuation and no consumption has been taken for the city of Newton, as it has not been supplied with water from the metropolitan works.

The division of the assessment for 1922 was as follows: —

Cities and Towns.	Assessment.	Cities and Towns.	Assessment.
Arlington	$24,666 84	Newton	$6,936 71
Belmont	15,679 21	Quincy	81,551 29
Boston	1,784,257 21	Revere	37,989 30
Chelsea	58,304 32	Somerville	128,207 84
Everett	65,437 63	Stoneham	11,344 37
Lexington	9,970 63	Swampscott	15,819 98
Malden	51,513 23	Watertown	33,916 60
Medford	41,268 34	Winthrop	19,128 14
Melrose	23,191 14		
Milton	13,798 19		$2,427,121 63
Nahant	4,140 66		

(5) Supplying Water to Cities and Towns outside of District and to Water Companies.

Sums have been received during the year 1922 under the provisions of the metropolitan water act, for water furnished, as follows: —

Town of Framingham	$4,935 24
City of Revere (on account of water furnished to a portion of the town of Saugus for the years 1920 ($580.00) and 1921 ($702.00)	1,282 00
United States government (for Peddock's Island)	1,102 01
Westborough State Hospital	2,539 38
	$9,858 63

The sums so received prior to March 23, 1907, were annually distributed among the cities and towns of the district, but since that date, in accordance with the provisions of chapter 238 of the Acts of 1907, the sums so received have been paid into the sinking fund.

(6) Expenditures for the Different Works.

The following is a summary of the expenditures made in the various operations for the different works: —

Construction and Acquisition of Works.	For the Year ending December 31, 1922.	
Administration applicable to all parts of the construction and acquisition of the works		$3,120 78
Distribution system:		
Northern high service:		
Section 48 (reinforcement of the northern high-service pipe lines)	$10,916 29	
Section 49 (reinforcement of the northern high-service pipe lines)	106,668 56	
Section 50 (reinforcement of the northern high-service pipe lines)	117,374 78	
Additional pumping machinery at Spot Pond Pumping station	1,460 84	
Southern high service:		
Additional pumping machinery at Chestnut Hill pumping station of the southern high service	52,664 41	
Northern extra high service:		
Arlington Reservoir in Arlington, Mass.	38,011 47	
Southern extra high service:		
Section 44 (additional water supply for the town of Milton and the Hyde Park district of the city of Boston)	873 72	
Weston Aqueduct supply mains, Section 9	146 50	
Weston Aqueduct supply mains, Section 10	40 91	
Weston Aqueduct supply mains, Section 11	28 15	
Weston Aqueduct supply mains, Section 12	28 44	
Meters and connections	553 60	
		328,767 67
Acquisition, existing water works (Spot Pond case)		3 37
Stock — pipes, valves, castings, etc., purchased and sent first to storage yards, and later transferred, as needed, to the various parts of the work: —		
Amount received	$138,644 55	
Transferred from storage yards to the various sections of the work and included in costs of special works	137,562 20	
		1,082 35
		$332,974 17
Amount charged from beginning of work to January 1, 1922		43,444,605 28
Total for construction and acquisition of works to January 1, 1923		$43,777,579 45

Maintenance and Operation.	For the Year ending December 31, 1922.	
Administration		$12,550 13
General supervision		36,668 78
Taxes and other expenses		49,663 96
Wachusett Department:		
Superintendence	$10,544 43	
Reservoir	29,471 40	
Forestry	11,171 88	
Protection of supply	6,827 50	
Buildings and grounds	5,966 83	
Wachusett Dam	10,131 09	
Wachusett Aqueduct	9,286 95	
Clinton sewerage system:		
Pumping station	2,454 52	
Sewers, screens and filter beds	9,031 63	
Sanitary inspection	1,135 62	
Swamp drainage	8,282 79	
Power plant	20,796 16	
Wachusett-Sudbury power transmission line	1,867 63	
Payments under industrial accident law and special benefit appropriations	148 29	
		127,116 72
Sudbury Department:		
Superintendence, Framingham office	$13,263 09	
Ashland Reservoir	3,639 44	
Hopkinton Reservoir	3,624 27	
Whitehall Reservoir	3,333 92	
Framingham Reservoirs Nos. 1, 2 and 3	13,610 27	
Sudbury Reservoir	16,474 63	
Lake Cochituate	11,490 74	
Marlborough Brook filters	3,965 52	
Pegan filters	9,558 69	
Sudbury and Cochituate watersheds	2,233 96	
Sanitary inspection	3,859 64	
Cochituate Aqueduct	4,789 95	
Sudbury Aqueduct	12,700 98	
Weston Aqueduct	10,948 70	
Forestry	11,353 35	
Power plant	11,230 39	
Payments under industrial accident law and special benefit appropriations	45 50	
		136,123 04
Distribution Department:		
Superintendence	$10,009 70	
Pumping service:		
Superintendence	6,363 16	
Payments under industrial accident law and special benefit appropriations	395 35	
Arlington pumping station, pumping service	18,803 55	
Chestnut Hill low-service pumping station, pumping service No. 2	105,227 80	
Chestnut Hill high-service pumping station, pumping service No. 1	44,077 20	
Spot Pond pumping station, pumping service	32,620 00	
Hyde Park pumping station, pumping service	12,961 90	
Arlington stand pipe	231 48	
Malden standpipe	1,167 10	
Bear Hill Reservoir	453 10	
Chestnut Hill Reservoir and grounds	23,770 59	
Fells Reservoir	1,720 65	
Forbes Hill Reservoir	4,223 38	
Mystic Lake, conduit and pumping station	10,421 90	
Mystic Reservoir	755 12	
Waban Hill Reservoir	488 94	
Weston Reservoir	5,454 54	
Spot Pond	11,144 23	
Buildings at Spot Pond	356 28	
Pipe lines:		
Low service	46,042 06	
Northern high service	10,359 62	
Northern extra high service	356 33	
Southern high service	9,537 44	
Southern extra high service	304 14	
Supply pipe lines	2,718 24	
Buildings at Chestnut Hill Reservoir	8,597 52	
Chestnut Hill pipe yard	4,859 85	
Glenwood pipe yard and buildings	3,255 87	
Stables	9,391 82	
Venturi meters	2,100 99	
Measurement of water	4,125 76	
Arlington pumping station, building and grounds	393 03	
Hyde Park pumping station, buildings and grounds	559 51	
Fisher Hill Reservoir	3,971 75	
Bellevue Reservoir	2,771 17	
Payments under industrial accident law and special benefit appropriations	651 96	
		400,643 03
Total for maintaining and operating works		$762,765 66

(7) Detailed Financial Statement under Metropolitan Water Act.

The Commissioner herewith presents, in accordance with the requirements of the metropolitan water act, a detailed statement of the expenditures and disbursements, receipts, assets and liabilities for the year 1922.

(*a*) *Expenditures and Disbursements.*

The total amount of the expenditures and disbursements on account of construction and acquisition of works for the year beginning January 1, 1922, and ending December 31, 1922, was $332,974.17 and the total amount from the time of the organization of the Metropolitan Water Board, July 19, 1895, to December 31, 1922, has been $43,777,579.45.

For maintenance and operation the expenditures for the year were $762,765.66.

The salaries of the commissioners, and the other expenses of administration, have been apportioned to the construction of the works and to the maintenance and operation of the same, and appear under each of those headings.

The following is a division of the expenditures according to their general character: —

General Character of Expenditures.	For the Year ending December 31, 1922.	
Construction of Works and Acquisition by Purchase or Taking.		
Administration.		
Clerks and stenographers	$2,865 00	
Stationery and printing	168 47	
Postage, express and telegrams	28 25	
Telephone, lighting, heating, water and care of building	4 89	
Miscellaneous expenses	54 17	
		$3,120 78
Engineering.		
Chief engineer	$477 43	
Principal assistant engineers	2,918 47	
Engineering assistants	9,327 06	
Inspectors	1,786 12	
Architects	1,000 00	
Railroad and street car travel	82 22	
Wagon hire	75	
Stationery and printing	193 63	
Engineering and draughting supplies	178 97	
Books, maps and photographic supplies	80 90	
Telephone, lighting, heating, water and care of buildings, main office	14 67	
Miscellaneous expenses	114 99	
		16,175 21
Construction.		
Preliminary work:		
Advertising		154 95
Contracts, distribution system:		
Atlantic Works, Contract 14, for 30-inch hydraulic lift valves	$2,796 30	
George M. Bryne, Contract 23, for laying Section 50, of the northern high service pipe lines	44,304 53	
Coffin Valve Co., Contract 21, for furnishing manhole frames and covers	9,783 50	
Maurice M. Devine, Contract 26, for sandblasting and painting steel tank of the northern extra high service on Arlington Heights	3,561 50	
D. M. Dillon Steam Boiler Works, Contract 1, for furnishing two vertical fire-tube boilers for Chestnut Hill Pumping Station No. 1	989 50	
Gibby Foundry Co., Contract 22, for furnishing cast-iron frames and covers for gate chambers	1,274 98	
Johns-Manville Inc., of Mass., Contract 17, for non-heat-conducting covering for boilers and steam piping at Chestnut Hill pumping station, No. 1	884 00	
Kelley & Sullivan, Contract 24, for laying water pipes in Malden and Everett on Section 48 in part, for the northern high service pipe lines of the Distribution System	5,400 00	
Kelley & Sullivan, Contract 24, for laying water pipes in Malden & Everett, on Section 49 in part, for the northern high service pipe lines of the Distribution System	39,192 05	
Lumsden & Van Stone Co., Contract 13, for flanged special castings	363 66	
Norfolk Iron Co., Contract 16, for galleries for two boilers at Chestnut Hill pumping station, No. 1	193 20	
George T. Rendle, Contract 11, for laying 12-inch water pipes under the Neponset River, and New York, New Haven & Hartford Railroad, Boston	862 92	
Amounts carried forward	$109,606 14	$19,450 94

General Character of Expenditures.	For the Year ending December 31, 1922.	
Amounts brought forward	$109,606 14	$19,450 94
Construction — Con.		
Contracts, distribution system — *Con.*		
Underwood Machinery Co., Contract 9, for coal conveying equipment at Chestnut Hill pumping station No. 1	142 50	
United States Cast Iron Pipe & Foundry Co., Contract 20, furnishing cast-iron water pipes and special castings	5,918 05	
Walsh's Holyoke Steam Boiler Works, Contract 18, for removing and disposing of an existing water tank on Arlington Heights, and building a steel tank on the same site, for the northern extra high service of the Distribution System	28,250 15	
Warren Foundry Machinery Co., Contract 12, for cast-iron water pipes and special castings	308 80	
Warren Foundry & Machinery Co., Contract 19, for furnishing cast-iron water pipes and special castings	116,471 29	
Worthington Pump & Machinery Corp., Contract 3, for building and erecting pumping engine at Chestnut Hill Pumping Station No. 1	30,360 00	
		291,056 93
Additional work:		
Labor	$10,380 00	
Traveling	4 67	
Freight and express	64 37	
Tools, machinery, appliances and hardware supplies	1,500 37	
Electrical supplies	327 84	
Castings, ironwork and metals	3,271 16	
Iron pipe and valves	2,670 83	
Paint and coating	611 72	
Lumber and field buildings	1,883 39	
Drain pipe	50 94	
Brick, cement and stone	1,060 25	
Sand, gravel and filling	205 71	
Municipal and corporation work	293 35	
Unclassified supplies	44 31	
Miscellaneous expenses	69 90	
		22,438 81
Real Estate.		
Legal and expert:		
Conveyancing expenses		24 12
Purchase of Existing Water Works.		
Legal and expert:		
Miscellaneous expenses		3 37
		$332,974 17
Amount charged from beginning of work to January 1, 1922		43,444,605 28
Total amount of construction expenditures to January 1, 1923		$43,777,579 45
Maintenance and Operation of Works.		
Administration:		
Commissioners	$2,500 00	
Secretary and assistants	6,303 75	
Rent	515 62	
Repairs of buildings	403 55	
Fuel	171 67	
Lighting	218 97	
Care of building	944 15	
Postage	110 00	
Printing, stationery, and office supplies	973 93	
Telephones	156 51	
Travelling expenses	30 00	
Miscellaneous expenses	221 98	
		12,550 13
General supervision:		
Chief engineer and assistants	$26,216 65	
Rent	1,546 88	
Repairs of building	1,363 65	
Fuel	515 03	
Lighting	451 40	
Care of building	2,832 53	
Postage	88 00	
Express and telegrams	222 81	
Printing, stationery and office supplies	1,309 49	
Telephones	631 84	
Traveling expenses	1,112 73	
Miscellaneous expenses	377 77	
		36,668 78
Amount carried forward		$19,218 91

General Character of Expenditures.	For the Year ending December 31, 1922.	
Amount brought forward		$49,218 91
Pumping service:		
Superintendence	$6,363 16	
Labor	121,276 24	
Fuel	73,978 79	
Oil, waste and packing	2,210 26	
Repairs	13,931 06	
Small supplies	2,294 10	
Payments under industrial accident law and special benefit appropriations	395 35	
		220,448 96
Reservoirs, aqueducts, pipe lines, buildings and grounds:		
Superintendents	$8,366 83	
Engineering assistants	20,094 39	
Sanitary inspectors	4,080 00	
Labor, pay roll	304,448 12	
Labor, miscellaneous	115 71	
Alterations and repairs of pumping stations	1,419 72	
Alterations and repairs of other buildings and structures	9,277 89	
Automobiles	11,507 49	
Brick	1 68	
Brooms, brushes and janitor's supplies	535 54	
Castings, ironwork and metals	2,134 50	
Cement and lime	621 03	
Drafting and photo supplies	205 21	
Electrical supplies	2,207 96	
Fertilizer and planting material	1,743 39	
Freight and express	800 11	
Fuel	3,768 08	
Gypsy moth supplies	1,868 97	
Hardware	2,650 77	
Hay and grain	1,104 16	
Horses	400 00	
Lighting	310 20	
Lumber	2,705 13	
Machinery	3,308 32	
Paints and oils	2,398 62	
Pipe and fittings	2,294 39	
Postage	54 27	
Printing, stationery and office supplies	902 09	
Rubber and oiled goods	515 32	
Stable expenses	1,178 39	
Sand, gravel and stone	606 59	
Traveling expenses	3,851 85	
Telephones	1,439 21	
Teaming	3,329 05	
Tools and appliances	7,920 82	
Vehicles, harnesses and fittings	487 60	
Miscellaneous expenses	10,962 01	
Contracts:		
George E. Babcock, Contract 13-M, for painting steel tank at Bellevue Reservoir, Boston	1,629 08	
George E. Babcock, Contract 16-M, for painting Water Works buildings at Chestnut Hill Reservoir, Boston	573 75	
Central Building Co., Contract 7-M, for granite facing for circular dam at Quinapoxet River in West Boylston, Mass.	4,537 25	
Charles W. Dolloff & Co., Contract 12-M, for repairing side tracks at Chestnut Hill Reservoir, Boston	3,376 95	
Thomas P. Hurley, Contract 10-M, for alterations to house at Sudbury Dam	2,000 00	
Thomas P. Hurley, Contract 11-M, for constructing a gaging chamber on Sudbury Aqueduct in Sherborn, Mass.	2,011 95	
Lombard Governor Co., Contract 6-M, for furnishing governors for Wachusett Power Plant at Clinton, Mass.	3,917 13	
Edwin H. Lowe, for rebuilding the Beaven house in Clinton, Mass., authorized by vote of the Commission September 21, 1922	975 00	
New England Power Co., for reconstructing the Wachusett tap line (so called) in accordance with proposal of September 22, 1922	510 00	
New England Power Co., for work on Wachusett-Sudbury power transmission line, in accordance with proposal of September 27, 1922	1,375 80	
W. L. Waples Co., Contract 14-M, for painting Forbes Hill standpipe, Quincy	819 40	
Improvement and protection of water supplies	796 76	
Water from city of Worcester	449 60	
Payments under industrial accident law and special benefit appropriations	845 75	
		443,433 83
Payments in lieu of taxes		49,663 96
Total expenditures for maintenance and operation		$762,765 66

(*b*) *Receipts.*

The total amount of receipts from the operations of the Commission and from sales of property for the year beginning January 1, 1922, and ending December 31, 1922, was $112,100.46; and the total amount from the time of the organization of the Metropolitan Water Board, July 19, 1895, to December 31, 1922, has been $1,957,506.52. The general character of these receipts is as follows: —

General Character of Receipts.	For the Year ending December 31, 1922.	
Applicable to the loan fund:		
Land and buildings	$661 90	
Construction tools, supplies and reimbursements	2,241 19	
		$2,903 09
Applicable to payment of interest, sinking fund requirements and expenses of maintenance and operation:		
Proceeds from operations of the Board:		
Rents	$2,604 70	
Land products	7,982 07	
Electric energy	83,808 19	
Maintenance labor, tools, supplies and reimbursements	4,847 17	
Interest and unclassified receipts	96 61	
		99,338 74
Applicable to the sinking fund:		
Water supplied to cities and towns, water companies and others		9,858 63
		$112,100 46
Amount credited from beginning of work to January 1, 1922		1,845,406 06
Total receipts to January 1, 1923		$1,957,506 52

The foregoing receipts have been credited to the various objects or works, as follows: —

Sources of Receipts.	For the Year ending December 31, 1922.	
Supplying water outside of water district		$9,858 63
Construction and acquisition of works:		
Administration	$251 00	
Distribution system	1,990 19	
Purchase of existing water works	661 90	
		2,903 09
Maintenance and operation of works:		
Administration	$687 16	
General supervision	1,805 53	
Wachusett Aqueduct	641 01	
Wachusett Reservoir	3,907 55	
Wachusett electric power plant	47,399 88	
Sudbury system	5,187 56	
Sudbury electric power plant	36,411 74	
Distribution system	1,878 37	
Clinton sewerage system	1,419 94	
		99,338 74
		$112,100 46
Amount credited from beginning of work to January 1, 1922		1,845,406 06
Total receipts to January 1, 1923		$1,957,506 52

(*c*) *Assets.*

The following is an abstract of the assets of the water works, a complete schedule of which is kept on file in the office of the Commission: —

Office furniture, fixtures and supplies; engineering and scientific instruments and supplies; police supplies; horses, vehicles, field machinery, etc.; machinery, tools and other appliances and supplies; completed works, real estate and buildings connected therewith.

(*d*) *Liabilities.*

There are sundry bills for current expenses which have not yet been received.

Amount of Monthly Estimates, not due until Completion of Contract or until Claims are settled.

Name.	Work.	Amount.
George E. Babcock Co.	Contract 13-M, for painting steel tank at Bellevue Reservoir, Boston	$287 48
George E. Babcock Co.	Contract 16-M, for painting water works buildings at Chestnut Hill Reservoir, Boston	101 25
George M. Bryne	Contract 23, for laying water pipes in Malden & Everett, Section 50 of the northern high-service pipe lines	7,730 21
Coffin Valve Co.	Contract 21, for manhole frames and covers	1,726 50
Maurice M. Devine	Contract 26, for sand-blasting and painting steel tank on Arlington Heights	628 50
Chas. W. Dolloff & Co.	Contract 12-M, for repairing side tracks at Chestnut Hill Reservoir, Boston	595 93
Thomas P. Hurley	Contract 11-M, for constructing a gaging chamber on Sudbury Aqueduct in Sherborn, Mass.	355 05
Kelley & Sullivan	Contract 24, for laying water pipes in Malden & Everett, Section 48 (in part) and Section 49 of the northern high service pipe lines	7,269 18
Harvey L. Maney	Contract 15, for constructing reservoir foundation on Arlington Heights	1,330 35
Walsh's Holyoke Steam Boiler Works	Contract 18, for steel tank for Arlington reservoir on Arlington Heights	1,486 85
W. L. Waples	Contract 14-M, for painting Forbes Hill Standpipe, Quincy	144 60
Warren Foundry & Machinery Co.	Contract 19, for furnishing cast-iron water pipes and special castings	20,553 76
Worthington Pump & Machinery Corp.	Contract 3, for building and erecting pumping engine at Chestnut Hill Pumping Station No. 1	7,590 00

Settlements are pending with the following parties for land and easements taken in lands owned by them: —

New York, New Haven & Hartford Railroad Company, Frederique Ropp, heirs of Ella Wood, Jack Calcia, Brayton D. Fisher, heirs of Andrew Temple, of Medford, heirs of Thomas Casey, Georgia N. Mayberry et als. Tr., Charles W. Perkins, Tr., James E. Norton and Estate of Daniel L. Barry, Rosario Iorio, Caroline R. Lawrence, Angelo Sacco, Lewis H. Bonelli, Walter S. Sherman, Fannie H. Levy, Henry B. Jacobs, Gertrude E. Kennedy, George A. Graves, Frank A. Melanson, Boston & Maine Railroad.

SEWERAGE WORKS.

(1) Metropolitan Sewerage Loans, Receipts and Payments.

The loans authorized for the construction of the Metropolitan Sewerage Works, the receipts which are added to the proceeds of these loans, the expenditures for construction, and the balances available on January 1, 1923, have been as follows: —

North Metropolitan System.

Loans authorized under various acts to January 1, 1923 for the construction of the North Metropolitan System and the various extensions		$7,662,365 73
Receipts from sales of real estate and from miscellaneous sources which are placed to the credit of the North Metropolitan System:		
For the year ending December 31, 1922	$282 00	
For the period prior to January 1, 1922	87,422 16	
		87,704 16
		$7,750,069 89

Amount approved for payment from the Metropolitan Sewerage Loan Fund, North System:		
For the year ending December 31, 1922	$2,156 80	
For the period prior to January 1, 1922	7,572,580 11	
		7,574,736 91
Balance, North Metropolitan System, January 1, 1923		$175,332 98

South Metropolitan System.

Loans authorized under the various acts to January 1, 1923, applied to the construction of the Charles River Valley sewer, Neponset valley sewer, high-level sewer and extensions, constituting the South Metropolitan System		$9,992,046 27
Receipts from pumping, sales of real estate and from miscellaneous sources, which are placed to the credit of the South Metropolitan System:		
For the year ending December 31, 1922	$1 08	
For the period prior to January 1, 1922	24,637 40	
		24,638 48
		$10,016,684 75
Amount approved for payment from the Metropolitan Sewerage Loan Fund, South System:		
On account of the Charles River valley sewer	$800,046 27	
On account of the Neponset valley sewer	911,531 46	
On account of the high-level sewer and extensions, including Wellesley extension:		
For the year ending December 31, 1922 $7,731 79		
For the period prior to January 1, 1922 8,193,290 21		
	8,201,022 00	
		9,912,599 73
Balance, South Metropolitan System, January 1, 1923		$104,085 02

(2) Total Sewerage Debt, December 31, 1922.

North Metropolitan System.

Bonds issued by the Treasurer of the Commonwealth:		
Sinking fund bonds (3 and 3½ per cent)		$6,563,000 00
Serial bonds (3½ and 4 per cent)		925,500 00
Total bond issue to December 31, 1922		$7,488,500 00
Serial bonds paid prior to January 1, 1922	$181,000 00	
Serial bonds paid in 1922	25,500 00	
		206,500 00
Total bond issue outstanding December 31, 1922		$7,282,000 00
Gross sewerage debt		$7,282,000 00
Sinking fund December 31, 1922		3,835,862 58
Net sewerage debt December 31, 1922		$3,446,137 42

A net decrease for the year of $327,346.51.

South Metropolitan System.

Bonds issued by the Treasurer of the Commonwealth:		
Sinking fund bonds (3 and 3½ per cent)		$8,877,912 00
Serial bonds (4, 4½ and 5 per cent)		1,045,000 00
Total bond issue to December 31, 1922		$9,922,912 00
Serial bonds paid prior to January 1, 1922	$117,000 00	
Serial bonds paid in 1922	30,000 00	
		147,000 00
Total bond issue outstanding December 31, 1922		$9,775,912 00
Gross sewerage debt		$9,775,912 00
Sinking fund December 31, 1922		2,381,236 99
Net sewerage debt December 31, 1922		$7,394,675 01

A net decrease for the year of $147,024.68.

(3) North and South Metropolitan Loan and Sinking Funds, December 31, 1922.

Year.	Loans.		Bonds issued (Sinking Fund).		Bonds issued (Serial Bonds).		Sinking Fund.
	North System.	South System.	North System.	South System.	North System.	South System.	North and South Systems.
1889	$5,000,000 00	–	–	–	–	–	–
1890	–	–	$2,200,000	$800,000	–	–	–
1891	–	–	368,000	–	–	–	–
1892	–	–	1,053,000	–	–	–	–
1893	–	–	579,000	–	–	–	–
1894	500,000 00	–	500,000	–	–	–	–
1895	300,000 00	$500,000 00	300,000	300,000	–	–	–
1896	30,000 00	–	30,000	200,000	–	–	–
1897	85,000 00	300,000 00	80,000	300,000	–	–	–
1898	215,000 00	35,000 00	220,000	35,000	–	–	–
1899	–	4,625,000 00	–	1,025,000	–	–	$361,416 59
1900	265,000 00	10,912 00[1]	265,000	10,912	–	–	454,520 57
1901	–	40,000 00	–	2,040,000	–	–	545,668 26
1902	–	–	–	864,000	–	–	636,084 04
1903	500,000 00	1,000,000 00	500,000	1,736,000	–	–	754,690 41
1904	–	392,000 00	–	392,000	–	–	878,557 12
1905	–	–	–	–	–	–	1,008,724 95
1906	55,000 00	1,175,000 00	55,000	175,000	–	–	1,146,998 68
1907	–	–	–	300,000	–	–	1,306,850 30
1908	413,000 00	–	–	700,000	–	–	1,492,418 98
1909	–	–	300,000	–	–	–	1,673,784 40
1910	56,000 00	–	113,000	–	–	–	1,931,741 89
1911	6,000 00	–	–	–	–	–	2,184,674 98
1912	378,000 00	–	–	–	$62,000	–	2,458,541 20
1913	–	–	–	–	378,000	–	2,749,337 90
1914	130,500 00	350,000 00	–	–	–	–	3,011,512 44
1915	83,000 00[2]	5,000 00	–	–	130,500	–	3,290,979 46
1916	285,000 00	40,000 00	–	–	70,000	$355,000	3,604,657 27
1917	–	325,000 00	–	–	285,000	40,000	3,925,792 75
1918	–	–	–	–	–	325,000	4,270,205 50
1919	–	225,000 00	–	–	–	–	4,695,573 07
1920	–	100,000 00	–	–	–	225,000	5,168,524 03
1921	–	–	–	–	–	–	5,698,228 38
1922	150,000 00	80,000 00	–	–	–	100,000	6,217,099 57
	$8,451,500 00[3]	$9,202,912 00	–	–	–	–	–
	789,134 27	789,134 27	–	–	–	–	–
	$7,662,365 73	$9,992,046 27	$6,563,000	$8,877,912	$925,500	$1,045,000	–

[1] The sum of $10,912 was appropriated to reimburse the town of Watertown for the expense of constructing the Watertown siphon.

[2] This amount includes $13,000, balance of appropriation for north metropolitan maintenance under chapter 775, Acts of 1914, which was transferred to North Metropolitan Loan Fund, under authority of chapter 76, Resolves, of 1915. No bonds to be issued, as this was cash.

[3] Of this amount, $789,134.27 was expended for the construction of the Charles River valley sewer, which is now included in the South Metropolitan System.

(4) Sewer Assessments, 1922.

The following sewer assessments were made by the Treasurer of the Commonwealth upon the various municipalities:

North Metropolitan Sewerage System.

Sinking fund requirements		$151,012 22
Serial bonds		23,000 00
Interest		247,117 33
Maintenance:		
Appropriated by Legislature	$315,800 00	
Less balance on hand	29,955 20	
		285,844 80
Total North Metropolitan sewerage assessment		$706,974 35

South Metropolitan Sewerage System.

Sinking fund requirements		$124,679 34
Serial bonds		28,371 01
Interest		353,325 23
Maintenance:		
Appropriated by Legislature	$188,700 00	
Less balance on hand	18,313 48	
		170,386 52
Total South Metropolitan sewerage assessment		$676,762 10

In accordance with the provisions of sections 5 and 6, chapter 92 of the General Laws, the proportion to be paid by each city and town to meet the interest and sinking fund requirements for each year is based upon their respective taxable valuations, and to meet the cost of maintenance and operation upon their respective populations.

The divisions of the assessments for 1922 were as follows: —

North Metropolitan Sewerage System.

Cities and Towns.	Assessment.	Cities and Towns.	Assessment.
Arlington	$23,581 09	Reading	$9,171 03
Belmont	14,981 52	Revere[1]	29,419 52
Boston	102,146 67	Somerville	95,065 14
Cambridge	144,571 01	Stoneham	8,107 72
Chelsea	44,711 33	Wakefield	14,649 43
Everett[1]	46,511 28	Winchester	18,994 25
Lexington	6,651 45	Winthrop	17,617 18
Malden[1]	50,585 33	Woburn	17,457 89
Medford	41,392 91		
Melrose	21,359 60	Total	$706,974 35

[1] Exclusive of $3,940.01 special assessments on Everett, Malden and Revere.

South Metropolitan Sewerage System.

Cities and Towns.	Assessment.	Cities and Towns.	Assessment.
Boston	$325,192 17	Waltham	$41,221 03
Brookline	90,750 49	Watertown	29,137 72
Dedham	14,483 66	Wellesley	15,633 97
Milton	19,003 62		
Newton	82,777 50	Total	$676,762 10
Quincy	58,561 94		

(5) Expenditures for the Different Works.

The following is a summary of the expenditures made in the various operations for the different works: —

Construction and Acquisition of Works.		For the Year ending December 31, 1922.	
North Metropolitan System.			
North System, enlargement:			
Administration		$13 48	
New Mystic Sewer in Woburn and Winchester (chapter 529, Acts of 1922):			
Section 71	$1,103 59		
Section 72	1,039 73		
		2,143 32	
			$2,156 80
Amount charged from beginning of work to January 1, 1922			7,572,580 11
Total for North Metropolitan System to January 1, 1923			$7,574,736 91
South Metropolitan System.			
High-level sewer extensions:			
Wellesley extension:			
Section 99	$1,200 00		
Section 100	199 72		
Section 101	2,000 00		
Real estate:			
Settlements	2,400 00		
Legal, conveyancing and expert	74 06		
		$5,873 78	
Quincy Pumping Station and Force Main No. 2 (chapter 529, Acts of 1922)		1,858 01	
			$7,731 79
Amount charged from beginning of work to January 1, 1922			9,904,867 94
Total for South Metropolitan System to January 1, 1923			$9,912,599 73
Total for construction, both systems			$17,487,336 64

Maintenance and Operation.	For the Year ending December 31, 1922.
North Metropolitan System	$302,092 48
South Metropolitan System	180,894 75
Total for maintenance, both systems	$482,987 23

(6) Detailed Financial Statement.

The Commissioner herewith presents, in accordance with the metropolitan sewerage acts, an abstract of the expenditures and disbursements, receipts, assets and liabilities for the year ending December 31, 1922: —

(*a*) *Expenditures and Disbursements.*

General Character of Expenditures		For the Year ending December 31, 1922.	
Construction of Works and Acquisition by Purchase or Taking.			
North System Enlargement.			
Administration:			
Stationery, printing and office supplies			$13 48
Engineering:			
Engineering assistants		$1,955 32	
Traveling expenses		44 60	
Stationery, printing and office supplies		40	
Engineering and draughting supplies		56 01	
Miscellaneous expenses		86 99	
			2,143 32
Total for North Metropolitan System			$2,156 80

General Character of Expenditures.	For the Year ending December 31, 1922.	
South Metropolitan System.		
High-level Sewer Extensions.		
Engineering:		
Chief Engineer	$416 66	
Engineering assistants	455 00	
Inspectors	290 00	
Stationery, printing and office supplies	14 50	
		$1,176 16
Construction:		
Advertising	$34 55	
Labor and teaming	8 00	
Tools, machinery and appliances	579 94	
Brick, cement, lumber and other field supplies and expenses	59 36	
		681 85
Contracts:		
Rendle-Stoddard Co., Contract 3, for constructing Section 99 (in part) of the Wellesley extension of the high-level sewer in Dedham	$1,200 00	
Bruno & Petitti, Contract 2, for constructing Section 100 of the Wellesley extension of the high-level sewer in Dedham	199 72	
Rendle-Stoddard Co., Contract 145, for constructing Section 101 of the Wellesley extension of the high-level sewer in Needham and Dedham	2,000 00	
		3,399 72
Real estate:		
Legal, conveyancing and expert	$74 06	
Settlements	2,400 00	
		2,474 06
Total for South Metropolitan System		$7,731 79
Maintenance and Operation of Works.		
North Metropolitan System.		
Administration:		
Commissioners	$1,250 00	
Secretary and assistants	2,439 50	
Rent	164 06	
Heating, lighting and care of building	345 92	
Repairs of building	71 33	
Postage	60 00	
Printing, stationery and office supplies	429 91	
Telephones	50 16	
Miscellaneous expenses	14 92	
		$4,825 80
General supervision:		
Chief engineer and assistants	$11,013 83	
Rent	492 19	
Heating, lighting and care of building	1,037 89	
Repairs of building	307 33	
Printing, stationery and office supplies	165 29	
Telephones	150 50	
Traveling expenses	50 00	
Miscellaneous expenses	50 56	
		13,267 59
Deer Island pumping station:		
Labor	$32,790 55	
Fuel	20,958 50	
Oil and waste	567 25	
Water	1,234 20	
Packing	177 49	
Repairs and renewals	2,210 51	
General supplies	485 15	
Miscellaneous supplies and expenses	309 69	
		58,733 34
East Boston pumping station:		
Labor	$36,826 70	
Fuel	30,247 63	
Oil and waste	896 47	
Water	1,435 50	
Packing	330 56	
Repairs and renewals	2,661 74	
General supplies	1,328 02	
Miscellaneous supplies and expenses	1,516 83	
		75,243 45
Amount carried forward		$152,070 18

General Character of Expenditures.	For the Year ending December 31, 1922.	
Amount brought forward		$152,070 18
North Metropolitan System — Con.		
Charlestown pumping station:		
Labor	$24,260 00	
Fuel	10,266 47	
Oil and waste	436 08	
Water	576 84	
Packing	92 24	
Repairs and renewals	435 82	
General supplies	286 42	
Miscellaneous supplies and expenses	857 02	
		37,210 89
Alewife Brook pumping station:		
Labor	$12,231 35	
Fuel	5,338 56	
Oil and waste	303 56	
Water	293 64	
Packing	37 77	
Repairs and renewals	128 35	
General supplies	60 69	
Miscellaneous supplies and expenses	213 28	
		18,607 20
Reading pumping station:		
Labor	$6,478 75	
Fuel	15 75	
Oil and waste	16 31	
Repairs and renewals	18 96	
General supplies	3,962 31	
Miscellaneous supplies and expenses	381 33	
		10,873 41
Sewer lines, buildings and grounds:		
Engineering assistants	$2,640 00	
Labor	53,153 17	
Automobiles	2,098 92	
Brick, cement and lime	655 47	
Castings, ironwork and metals	1,874 44	
Freight, express and teaming	225 11	
Fuel and lighting	213 25	
Jobbing and repairing	4,110 66	
Lumber	1,953 20	
Machinery, tools and appliances	682 56	
Paints and oils	1,102 17	
Rubber and oiled goods	75 75	
Sand, gravel and stone	432 06	
Telephones	371 73	
Traveling expenses	1,521 82	
General supplies	2,157 58	
Miscellaneous expenses	2,096 71	
		75,364 60
Horses, vehicles and stable account		4,589 04
Payments under industrial accident law and special benefit appropriations		898 49
For the completion of Reading extension pumping station (item 635, chapter 203, Acts of 1921):		
Additional	$75 00	
Real estate, settlements	2,100 00	
Legal, conveyancing and expert	303 67	
		2,478 67
Total for North Metropolitan System		$302,092 48
South Metropolitan System.		
Administration:		
Commissioners	$1,250 00	
Secretary and assistants	2,109 25	
Rent	164 06	
Heating, lighting and care of building	335 51	
Repairs of building	58 12	
Postage	50 00	
Printing, stationery and office supplies	381 48	
Telephones	50 30	
Miscellaneous expenses	80 42	
		$4,479 14
General supervision:		
Chief engineer and assistants	$6,660 00	
Rent	492 19	
Heating, lighting and care of building	1,006 64	
Amounts carried forward	$8,158 83	$4,479 14

General Character of Expenditures.	For the Year ending December 31, 1922.	
Amounts brought forward	$8,158 83	$4,479 14
South Metropolitan System — Con.		
General supervision — *Con.*		
Repairs of building	211 78	
Postage	20 00	
Printing, stationery and office supplies	262 41	
Telephones	150 92	
Miscellaneous expenses	65 03	
		8,868 97
Ward Street pumping station:		
Labor	$39,059 84	
Fuel	26,809 73	
Oil and waste	768 94	
Water	1,173 74	
Packing	251 07	
Repairs and renewals	1,840 84	
General supplies	1,516 04	
Miscellaneous supplies and expenses	1,397 38	
		72,817 58
Quincy pumping station:		
Labor	$12,696 30	
Fuel	3,979 10	
Oil and waste	336 92	
Water	350 46	
Packing	179 77	
Repairs and renewals	390 47	
General supplies	372 65	
Miscellaneous supplies and expenses	78 29	
		18,383 96
Nut Island screen-house:		
Labor	$12,998 60	
Fuel	3,220 00	
Oil and waste	145 05	
Water	355 23	
Packing	41 94	
Repairs and renewals	180 42	
General supplies	526 61	
Miscellaneous supplies and expenses	81 39	
		17,549 24
Sewer lines, buildings and grounds:		
Engineering assistants	$5,820 00	
Labor	35,667 89	
Automobiles	737 14	
Brick, cement and lime	603 72	
Castings, ironwork and metals	141 53	
Fuel and lighting	22 13	
Jobbing and repairing	216 38	
Lumber	1,025 70	
Machinery, tools and appliances	1,368 17	
Paints and oils	694 06	
Rubber and oiled goods	128 12	
Sand, gravel and stone	119 46	
Telephones	233 95	
Traveling expenses	996 90	
General supplies	1,637 76	
Miscellaneous expenses	356 77	
		49,769 68
City of Boston for pumping		5,869 36
Horses, vehicles and stable account		2,615 82
Payments under industrial accident law and special benefit appropriations		541 00
Total for South Metropolitan System		$180,894 75

(*b*) *Receipts.*

The receipts from the sales of property, from rents and from other sources, have been credited as follows: —

Account.	For the Year ending December 31, 1922.
Construction:	
North Metropolitan System	$282 00
South Metropolitan System	1 08
Maintenance:	
North Metropolitan System	341 06
South Metropolitan System	402 70
Sinking fund:	
North Metropolitan System	75 00
Interest fund:	
North Metropolitan System	22 96
South Metropolitan System	20 28
	$1,145 08
Amount credited from beginning of work to January 1, 1922	162,296 77
Total receipts to January 1, 1923	$163,441 85

(*c*) *Assets.*

The following is an abstract of the assets of the sewerage works, a complete schedule of which is kept on file in the office of the Commission: —

Office furniture, fixtures and supplies; engineering and scientific instruments and supplies; horses, vehicles, field machinery, etc.; machinery, tools and other appliances and supplies; completed works, real estate connected therewith.

(*d*) *Liabilities.*

There are sundry bills for current expenses which have not yet been received.

Amounts on Monthly Estimates, not due until Completion of Contracts or until Claims are settled.

Name.	Work.	Amount.
High-level sewer extensions:		
Timothy O'Connell	Contract 57, Section 82 (in part)	$60 00

Settlements are pending with the following parties for easements taken in lands owned by them: —

Clifford M. Locke, Martha W. Burrage, Edward and Catherine Bingham, Hannah Bingham, Katherine H. Rooney, Mary A. Read, Hannah E. Pond, Richard G. Wadsworth, Bear Hill Associates, George A. Forbes, Maurice McKenna (Patrick J. McKenna, Tr.), Michael Flynn, Cornelius J. Sweeney, Mary A. Scally, Stoneham Branch Railroad.

APPENDIX

Appendix No. 1.

CONTRACTS MADE AND PENDING DURING

[The details of contracts made before

	1. Number of Contract.	2. Work.	3. Number of Bids.	Amount of Bid. 4. Next to Lowest.	Amount of Bid. 5. Lowest.	6. Contractor.
1	3	Building and erecting pumping engine for Chestnut Hill Pumping Station No. 1.	2	$86,600 00	$75,900 00[1]	Worthington Pump & Machinery Corporation, New York.
2	17[2]	Furnishing and applying non-heat-conducting covering for boilers and steam piping at Chestnut Hill Pumping Station No. 1.	6	945 00	884 00[1]	Johns-Manville, Inc., Boston.
3	18[2]	Furnishing Steel Tank for Arlington Reservoir.	8	30,860 00	29,737 00[1]	Walsh's Holyoke Steam Boiler Works, Holyoke, Mass.
4	19[2]	Furnishing 3,150 tons cast-iron water pipe: 1,450 tons 20-inch, 1,350 tons 24-inch, 300 tons 30-inch, 50 tons 20-inch and 24-inch flexible jointed pipe.	3	134,433 50	132,390 00[1]	Warren Foundry & Machine Co., Phillipsburg, N. J.
5	20[2]	Furnishing 50 tons special castings.	3	5,300 00	4,925 00[1]	United States Cast Iron Pipe & Foundry Company, Philadelphia, Pa.
6	21[2]	Furnishing water valves: 12 12-inch, 4 16-inch, 4 24-inch and 6 36-inch screw lift valves.	4	19,011 64	11,468 00[1]	Coffin Valve Co., Neponset, Mass.
7	22[2]	Furnishing cast-iron frames and covers: about 43,000 pounds.	5	1,505 00	1,238 40[1]	Gibby Foundry Co., East Boston.
8	23	Laying 20-inch water pipes in Malden and Medford.	7	53,355 00	51,718 00[1]	George M. Bryne, Winchester, Mass.
9	24	Laying 24-inch and 30-inch water pipes in Malden and Everett.	8	48,942 50[1]	46,235 00	Kelley & Sullivan, Somerville, Mass.

[1] Contract based upon this bid.

Appendix No. 1.

THE YEAR 1922 — WATER DIVISION.

1922 have been given in previous reports.]

7. Date of Contract.	8. Date of Completion of Contract.	9. Prices of Principal Items of Contract.	10. Value of Work done Dec. 31, 1922.	
Oct. 29, 1920	–	See previous report	$68,310 00	1
Feb. 1, 1922	Mar. 8, 1922	For furnishing and applying non-heat-conducting covering, $884.00.	884 00	2
Jan. 10, 1922	Aug. 1, 1922	For removing the existing water tank at Arlington Heights and building the new tank, $29,737.00.	29,737 00	3
Feb. 20, 1922	Oct. 31, 1922	For 20-inch, 24-inch and 30-inch straight pipe, $41.65 per ton of 2,000 pounds; for 20-inch and 24-inch flexible jointed pipe, $65.50 per ton of 2,000 pounds.	137,025 05	4
Feb. 20, 1922	Sept. 20, 1922	For special castings, $98.50 per ton of 2,000 pounds .	5,918 05	5
Mar. 25, 1922	Nov. 17, 1922	For 12-inch valves, $190 each; for 16-inch valves, $292 each; for 24-inch valves, $475 each; for 36-inch valves, $1,020 each.	11,510 00	6
Apr. 11, 1922	Aug. 15, 1922	For castings, 2.88 cents per pound	1,274 98	7
June 20, 1922	–	For laying ordinary 20-inch cast-iron pipe with joint-compound joints, $2.45 per lin. ft.; for making lead joints instead of joint-compound joints for ordinary 20-inch cast-iron pipe, $4.50 per joint; for laying flexible 20-inch cast-iron pipe with lead joints under B. & M. R.R., $5.00 per lin. ft.; for laying flexible 20-inch cast-iron pipe with lead joints under the Mystic River, $22.00 per lin. ft.; for laying ordinary 6-inch and 8-inch cast-iron pipe with joint-compound joints for blow-offs, $1.00 per lin. ft.; for rock excavation, $10.00 per cu. yd.; for earth excavation below grade, $3.00 per cu. yd.; for chambers for 20-inch valves, $85 per chamber; for chambers for 16-inch and smaller valves, $65 per chamber; for concrete masonry for foundations and for backing curves, $10.00 per cu. yd.; for furnishing and driving spruce piles for foundations, $0.75 per lin. ft.; for furnishing and placing spruce lumber for foundations, $75.00 per thousand feet Board Measure.	54,941 98	8
July 17, 1922	–	For laying ordinary 24-inch cast-iron pipe with lead joints, $3.40 per lin. ft.; for laying flexible 24-inch cast-iron pipe with lead joints under B. & M. R.R., $4.50 per lin. ft.; for laying 30-inch cast-iron pipe with lead joints, $5.50 per lin. ft.; for laying 6-inch and 8-inch cast-iron pipe with lead joints, for blow-offs, $2.25 per lin. ft.; for rock excavation, $8.00 per cu. yd.; for rock excavation below grade, $8.00 per cu. yd.; for earth excavation below grade, $2.00 per cu. yd.; for chambers for 24-inch and 30-inch valves, $120.00 per chamber; for chambers for 16-inch and smaller valves, $100.00 per chamber; for concrete masonry for foundations and for backing curves, $8.00 per cu. yd.; for furnishing and driving spruce piles for foundations, $0.75 per lin. ft.; for furnishing and placing spruce lumber for foundations, $100.00 per thousand feet Board Measure.	57,974 87	9

[2] Contract completed.

CONTRACTS MADE AND PENDING DURING

	1. Number of Contract.	2. Work.	3. Number of Bids.	Amount of Bid. 4. Next to Lowest.	Amount of Bid. 5. Lowest.	6. Contractor.
10	25[2]	Furnishing 2 vertical fire tube boilers for Chestnut Hill Pumping Station No. 1 and for Spot Pond Pumping Station.	3	$11,930 00	$11,690 00[1]	Coatesville Boiler Works, Coatesville, Pa.
11	26[2]	Painting steel tank for Arlington Reservoir.	2	4,540 00	4,490 00[1]	Maurice M. Devine, Boston.
12	27	For removing an old boiler and erecting 2 new boilers at Chestnut Hill Pumping Station No. 1 and Spot Pond Pumping Station.	4	3,095 00	2,869 00[1]	Youlden, Smith & Hopkins, Boston.
13	51-M	Sale and purchase of electric energy to be developed at Wachusett Dam in Clinton.	1	–	$5.30 per M kilowatt hours.	New England Power Company and Edison Electric Illuminating Company of Boston.
14	4-M[2]	7,000 net tons bituminous coal for Chestnut Hill, Arlington and Hyde Park Pumping Stations and for Pegan Pumping Station.	7	$3.38 net ton at mines to Oct. 1, 1921; $3.88 from Oct. 1, 1921, to Mar. 31, 1922.	$3.75 per net ton at mines	Wm. A. Jepson Corporation, Boston.
15	5-M[2]	800 to 1,000 net tons bituminous coal and 600 to 700 net tons anthracite screenings for Spot Pond Pumping Station.	–	–[3]	–[3]	Locke Coal Co., Malden.
16	6-M[2]	Governing equipment for Wachusett Power Station, Clinton.	–	–[3]	–[3]	Lombard Governor Company, Ashland, Mass.
17	7-M[2]	Granite facing for circular dam on Quinapoxet River, West Boylston.	6	11,478 00	11,450 00[1]	Central Building Company, Worcester, Mass.
18	9-M[2]	Furnishing Railings and Guards for the Chestnut Hill Pumping Stations.	9	1,300 00	1,047 00[1]	Builders Iron and Steel Company, East Cambridge, Mass.
19	10-M[2]	Alterations to house at Sudbury Dam, Southborough.	3	2,198 00	2,000 00[1]	Thomas P. Hurley, Marlborough, Mass.
20	11-M[2]	Building Gaging Chamber on Sudbury Aqueduct, Sherborn.	4	2,780 00	2,367 00[1]	Thomas P. Hurley, Marlborough, Mass.
21	12-M[2]	Repairing side tracks at Chestnut Hill Reservoir.	3	4,291 60	3,966 50[1]	C. W. Dolloff & Co., Boston.
22	13-M[2]	Painting steel tank at Bellevue Reservoir.	3	1,975 00	1,900 00[1]	George E. Babcock, Medford, Mass.
23	14-M[2]	Painting Forbes Hill Standpipe, Quincy.	2	975 00	964 00[1]	W. L. Waples Co., Roxbury.
24	15-M	Painting exterior woodwork and ironwork of Water Works buildings in Arlington, Boston and Stoneham.	3	860 00	691 00[1]	A. C. Dunbar, Hyde Park, Mass.
25	16-M[2]	Painting exterior woodwork and ironwork of Water Works buildings in Boston.	4	732 00	675 00[1]	George E. Babcock, Medford, Mass.
26	17-M	Furnishing 2 vertical fire tube boilers for Pegan Pumping Station, Natick.	4	2,324 00	2,180 00[1]	D. M. Dillon Steam Boiler Works, Fitchburg, Mass.
27	Agreement.	Sale and purchase of electric energy to be developed at Sudbury Dam in Southborough.	–	–[4]	–[4]	Edison Electric Illuminating Co. of Boston.

[1] Contract based upon this bid.

[2] Contract completed.

THE YEAR 1922 — WATER DIVISION — *Continued.*

7. Date of Contract.	8. Date of Completion of Contract.	9. Prices of Principal Items of Contracts.	10. Value of Work done Dec. 31, 1922.	
July 24, 1922	Dec. 30, 1922	For whole work, $11,690	$11,090 00	10
July 19, 1922	Nov. 23, 1922	For sand blasting and painting the steel tank, $4,490.00	4,190 00	11
Oct. 16, 1922	–	For removing and disposing of old boiler at Chestnut Hill Pumping Station No. 1 (Contractor to pay Commonwealth), $15.00; for erecting on foundation new boiler at Chestnut Hill Pumping Station No. 1, $987.00; for erecting on foundation new boiler at Spot Pond Pumping Station, $1,897.00.	–	12
Jan. 13, 1917	Jan. 1, 1929	See previous report	189,841 83	13
Apr. 16, 1921	Apr. 6, 1922	See previous report	29,187 48	14
May 4, 1921	Mar. 30, 1922	See previous report	12,770 20	15
Aug. 11, 1921	Aug. 31, 1922	See previous report	8,633 13	16
Sept. 7, 1921	Jan., 17, 1922	See previous report	11,350 00	17
Feb. 1, 1922	Apr. 26, 1922	For furnishing and installing railings and guards, $1,047.00.	1,035 00	19
Feb. 27, 1922	May 5, 1922	For labor and materials necessary to make alterations at tenement house at Sudbury Dam, $2,000.	2,000 00	19
Sept. 6, 1922	Nov. 23, 1922	For gaging chamber complete, $2,367	2,367 00	20
Oct. 11, 1922	Nov. 9, 1922	For renewing rails, $0.65 per linear foot of rail, including special steel; for renewing ties, $1.25 per tie, including special ties.	3,972 88	21
Nov. 6, 1922	Dec. 15, 1922	For cleaning and painting the steel tank, $1,900 . .	1,916 56	22
Nov. 7, 1922	Dec. 21, 1922	For cleaning and painting the Forbes Hill standpipe and the woodwork and ironwork of the masonry tower enclosing it, $964.	964 00	23
Oct. 30, 1922	–	For painting the exterior woodwork and ironwork of pumping station off Brattle Street in Arlington, $168.00; for painting exterior woodwork and ironwork of pumping station on Hyde Park Avenue in Boston, $148.00; for painting exterior woodwork and ironwork of pumping station and house at Spot Pond in Stoneham, $375.00.	662 00	24
Oct. 30, 1922	Dec. 1, 1922	For painting the exterior woodwork and ironwork of Pumping Station No. 2, stable, garage and pipe yard office, carpenter shop and derrick at Chestnut Hill Reservoir in Boston, $675.00.	675 00	25
Nov. 21, 1922	–	For building 2 vertical fire tube boilers and delivering them at the Pegan Pumping Station in Natick, $1,090 each.	–	26
Jan. 1, 1922	–	$6.25 per thousand kilowatt hours	36,243 22	27

[3] Competitive bids were not received.
[4] Sale of energy continued since Jan. 1, 1922, at same price as formerly under modified extension of Contract No. 39-M.

CONTRACTS MADE AND PENDING DURING THE YEAR 1922 — WATER DIVISION — *Concluded.*

Summary of Contracts, 1895 to 1922, inclusive.[1]

	Value of Work done Dec. 31, 1922.
Distribution Section, 8 contracts	$302,571 93
Pumping service, 4 contracts	80,284 00
	$382,855 93
415 contracts completed from 1896 to 1921, inclusive	17,716,024 00
	$18,098,879 93
Deduct for work done on 11 Sudbury Reservoir contracts by the city of Boston	512,000 00
Total of 427 contracts	$17,586,879 93

[1] In this summary contracts for the sale of used material and contracts charged to maintenance are excluded.

Appendix No. 2.

Table No. 1. — *Monthly Rainfall in Inches at Various Places on the Metropolitan Water Works, 1922.*

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Wachusett Watershed:													
Princeton	2.74	3.73	5.63	2.42	4.74	8.81	5.18	5.15	3.07	2.45	1.67	4.13	49.72
Jefferson	2.41	4.58	6.72	2.51	4.67	9.38	4.98	6.27	2.01	2.32	1.56	4.27	51.68
Sterling	2.32	3.38	6.53	1.94	4.98	9.69	4.91	4.80	3.39	2.23	1.71	3.85	49.73
Boylston	2.14	3.39	5.96	1.89	4.71	9.02	4.55	6.12	2.61	2.63	1.43	3.84	48.29
Sudbury Watershed:													
Sudbury Dam	2.06	3.26	5.22	1.65	5.60	9.76	3.33	4.62	3.86	2.30	1.28	3.40	46.34
Framingham	1.73	3.34	5.30	1.64	5.37	9.33	3.05	4.87	3.79	2.00	1.25	3.29	44.96
Ashland Dam	1.76	3.17	5.23	1.47	5.06	7.55	3.09	4.60	4.60	2.30	1.31	3.53	43.67
Cordaville	2.02	3.22	5.67	1.75	5.54	8.98	3.36	5.31	4.13	2.51	1.51	3.45	47.43
Lake Cochituate	1.85	3.38	5.58	1.79	5.06	10.53	3.06	4.11	4.42	2.33	1.24	3.66	47.01
Chestnut Hlll Reservoir	1.64	3.73	5.44	1.58	5.33	9.80	3.41	5.93	4.12	2.31	1.19	4.62	49.10
Spot Pond	1.65	3.32	5.47	1.61	5.44	11.33	3.69	3.97	3.24	2.81	1.22	4.21	47.96
Average of all	2.02	3.50	5.70	1.84	5.13	9.47	3.87	5.06	3.56	2.38	1.39	3.84	47.80
Average, Wachusett watershed	2.40	3.77	6.21	2.19	4.77	9.22	4.90	5.58	2.77	2.40	1.59	4.02	49.85
Average, Sudbury watershed	1.89	3.24	5.35	1.62	5.39	8.90	3.20	4.85	4.09	2.27	1.33	3.41	45.60

TABLE NO. 2.—*Rainfall in Inches at Chestnut Hill Reservoir, 1922.*

DATE.	Amount.	Duration.
Jan. 3	.03[1]	4.40 P.M. to 6.30 P.M.
Jan. 5	.12	1.30 A.M. to 12.30 P.M.
Jan. 11	1.20[2]	8.45 A.M. to
Jan. 12		2.15 A.M.
Jan. 21	.26[2]	5.45 A.M. to 3.40 P.M.
Jan. 28	.03[1]	5.45 A.M. to 3.00 P.M.
	1.64	
Feb. 2	.55	12.40 A.M. to 12.30 P.M.
Feb. 6	.20	6.40 A.M. to 4.40 P.M.
Feb. 9	.15[1]	6.00 P.M. to
Feb. 10		5.45 A.M.
Feb. 11	.04	1.40 P.M. to 7.00 P.M.
Feb. 12	.15[1]	10.30 P.M. to
Feb. 13		5.00 A.M.
Feb. 15	1.04[1]	7.35 A.M. to 8.30 P.M.
Feb. 16	.15[1]	6.30 A.M. to 12.30 P.M.
Feb. 19	.04	7.30 A.M. to 9.30 A.M.
Feb. 22	.72[2]	3.45 A.M. to
Feb. 23		8.30 P.M.
Feb. 27	.69[2]	4.30 A.M. to 4.30 P.M.
	3.73	
Mar. 2	.45[1]	12.45 A.M. to 12.30 P.M.
Mar. 4	.76	3.45 P.M. to
Mar. 5		5.00 P.M.
Mar. 7	.75	5.30 P.M. to 10.50 P.M.
Mar. 10	.03	6.30 P.M. to 8.00 P.M.
Mar. 20	1.31	1.00 A.M. to 11.30 P.M.
Mar. 27	.48	6.30 A.M. to
Mar. 29		5.00 A.M.
Mar. 30	1.66[1]	4.30 P.M. to
Mar. 31		8.00 A.M.
	5.44	
Apr. 1	.43[2]	7.00 A.M. to 5.00 P.M.
Apr. 8	.19	3.15 A.M. to 6.00 A.M.
Apr. 11	.17	8.00 P.M. to
Apr. 12		12.15 A.M.
Apr. 15	.49	3.30 A.M. to 8.00 P.M.
Apr. 17	.21	3.40 P.M. to 8.00 P.M.
Apr. 19	.09	8.15 P.M. to
Apr. 20		10.30 A.M.
	1.58	
May 4	3.95	7.30 A.M. to
May 6		1.15 A.M.
May 18	1.15	7.30 A.M. to
May 19		4.15 A.M.
May 19	.15	11.40 A.M. to 12.15 P.M.
May 21	.03	4.30 P.M. to 4.45 P.M.
May 25	.05	3.20 P.M. to 10.30 P.M.
	5.33	
June 2	.03	12.25 A.M. to 4.30 A.M.
June 3	.42	2.25 A.M. to 11.30 A.M.
June 6	.04	1.00 A.M. to 5.15 A.M.
June 9	.25	4.15 P.M. to 5.15 P.M.
June 11	1.07	12.15 P.M. to 6.30 P.M.
June 15	.04	2.15 P.M. to 3.30 P.M.
June 17	5.67	6.35 A.M. to
June 20		7.15 A.M.
June 21	1.14	6.10 A.M. to 10.00 P.M.
June 22	.10	3.25 P.M. to 6.00 P.M.
June 23	.04	4.00 P.M. to 4.20 P.M.
June 25	.16	9.00 A.M. to 12.45 P.M.
June 28	.35	4.30 A.M. to 8.45 A.M.
June 28	.24	6.50 P.M. to 8.15 P.M.
June 29	.25	6.35 P.M. to 9.15 P.M.
	9.80	
July 3	.37	7.00 A.M. to 7.30 A.M.
July 4	1.45	2.20 A.M. to
July 6		3.00 A.M.
July 8	.03	7.00 P.M. to 8.30 P.M.
July 13	.20	5.10 P.M. to 7.45 P.M.
July 14	.39	1.30 A.M. to 5.30 A.M.
July 18	.40	8.20 P.M. to
July 19		6.45 A.M.
July 22	.03	5.10 P.M. to 5.45 P.M.
July 23	.30	10.00 A.M. to
July 24		2.30 A.M.
July 24	.05	4.15 P.M. to 8.15 P.M.
July 27	.09	5.00 P.M. to
July 28		3.00 A.M.
July 28	.10	7.30 P.M. to 9.00 P.M.
	3.41	
Aug. 2	.07	5.50 A.M. to 3.45 P.M.
Aug. 4	1.65	4.30 P.M. to
Aug. 5		4.15 A.M.
Aug. 7	.09	11.30 A.M. to
Aug. 8		1.00 A.M.
Aug. 8	.21	8.00 A.M. to
Aug. 9		4.15 A.M.
Aug. 12	.23	11.30 A.M. to
Aug. 13		12.30 A.M.
Aug. 18	.08	11.25 P.M. to 11.50 P.M.
Aug. 19	.27	4.50 A.M. to 9.30 A.M.
Aug. 19	.02	10.45 P.M. to 11.50 P.M.
Aug. 25	.03	3.00 P.M. to 3.22 P.M.
Aug. 26	1.08	9.20 A.M. to
Aug. 27		3.45 A.M.
Aug. 27	2.20	8.00 A.M. to
Aug. 28		11.45 P.M.
	5.93	

[1] Snow.

[2] Rain and snow.

TABLE No. 2. — *Rainfall in Inches at Chestnut Hill Reservoir, 1922* — Concluded.

DATE.	Amount.	Duration.
Sept. 4	1.67	1.30 A.M. to 5.00 P.M.
Sept. 6	.47	2.00 P.M. to 4.00 P.M.
Sept. 12	1.17	2.45 A.M. to 5.00 P.M.
Sept. 15	.81	11.45 P.M. to
Sept. 16		4.30 A.M.
	4.12	
Oct. 6	.84	7.00 P.M. to
Oct. 8		1.00 P.M.
Oct. 10	.57	3.15 A.M. to
Oct. 11		5.00 P.M.
Oct. 23	.87	4.25 P.M. to 12.00 M.
Oct. 25	.03	6.00 A.M. to 7.00 A.M.
	2.31	
Nov. 6	.31	8.00 A.M. to
Nov. 8		1.00 P.M.
Nov. 8	.11	7.20 P.M. to 11.30 P.M.
Nov. 15	.07	9.30 A.M. to 8.20 P.M.
Nov. 20	.46	8.45 A.M. to 3.20 P.M.
Nov. 24	.06[2]	2.15 A.M. to 3.30 A.M.
Nov. 27	.18[1]	8.00 P.M. to
Nov. 28		7.00 A.M.
	1.19	
Dec. 5	.29[2]	5.00 A.M. to 2.00 P.M.
Dec. 7	.48[2]	5.00 P.M. to
Dec. 8		12.00 M.
Dec. 11	.21	10.45 P.M. to
Dec. 12		1.30 P.M.
Dec. 14	.74[2]	9.45 A.M. to
Dec. 15		3.00 P.M.
Dec. 17	.77[2]	4.30 A.M. to 10.00 P.M.
Dec. 28	2.13[2]	12.15 A.M. to
Dec. 29		1.30 P.M.
	4.62	

Total for year, 49.10 inches.

[1] Snow. [2] Rain and snow.

TABLE NO. 3. — *Wachusett System. — Statistics of Flow of Water, Storage and Rainfall in 1922.*

[Watershed above dam = 108.84 square miles.]

MONTH.	GALLONS PER DAY.								Rainfall (Inches).	Rainfall collected (Inches).	Percentage of Rainfall collected.
	Received from City of Worcester Watershed.	Discharged into Wachusett Aqueduct.[1]	Wasted into River below Dam.	Seepage through the North Dike.[2]	STORAGE.[3] Gain.	STORAGE.[3] Loss.	Total Yield of Watershed.	Yield per Square Mile.			
January	–	121,829,000	1,700,000	881,000	–	59,852,000	64,558,000	593,000	2.40	1.058	44.0
February	–	108,518,000	1,761,000	875,000	–	1,415,000	109,739,000	1,008,000	3.77	1.624	43.0
March	5,961,000	53,510,000	1,913,000	913,000	313,293,000	–	363,668,000	3,341,000	6.21	5.960	96.0
April	14,750,000	133,263,000	98,404,000	1,001,000	41,425,000	–	259,340,000	2,383,000	2.19	4.108	187.6
May	7,258,000	92,990,000	115,197,000	1,000,000	12,313,000	–	214,242,000	1,968,000	4.78	3.511	73.5
June	244,000	99,797,000	107,197,000	1,000,000	34,220,000	–	241,970,000	2,223,000	9.22	3.838	41.6
July	1,100,000	88,910,000	79,961,000	1,000,000	–	5,732,000	163,039,000	1,498,000	4.91	2.672	54.5
August	2,264,000	121,216,000	2,529,000	1,000,000	–	35,516,000	86,565,000	795,000	5.59	1.419	25.4
September	8,571,000	94,178,000	2,314,000	998,000	–	32,777,000	56,142,000	516,000	2.77	0.891	32.2
October	3,574,000	111,984,000	5,596,000	987,000	–	67,783,000	47,210,000	434,000	2.41	0.774[2]	32.1
November	–	103,480,000	70,987,000	947,000	–	117,917,000	57,497,000	528,000	1.59	0.912	57.3
December	–	102,219,000	24,432,000	910,000	–	67,332,000	60,229,000	553,000	4.02	0.987	24.5
Total	–	–	–	–	–	–	–	–	49.86	27.754	–
Average for year	3,682,000	102,550,000	42,694,000	960,000	1,307,000	–	143,829,000	1,321,000	–	–	55.67

[1] Including 224,000 gallons per day drawn from aqueduct for the supply of the Westborough State Hospital.
[2] Estimated.
[3] Aggregate storage in Wachusett Reservoir and in ponds and mill reservoirs.

TABLE No. 4. — *Sudbury System. — Statistics of Flow of Water, Storage and Rainfall in 1922.*

[Watershed = 75.2 square miles.]

MONTH.	GALLONS PER DAY.												
	Water received from Wachusett Reservoir.[1]	Water discharged through Sudbury Aqueduct.	Water discharged through Weston Aqueduct.	Water used by Framingham Water Works.	Water diverted from Watershed by Sewers, etc.	Water wasted into River below Lowest Dam.	STORAGE.		Total Yield of Watershed.	Yield per Square Mile.	Rainfall (Inches).	Rainfall collected (Inches).	Percentage of Rainfall collected.
							Gain.	Loss.					
January	121,648,000	84,684,000	40,235,000	1,268,000	1,119,000	17,206,000	1,458,000	–	24,323,000	323,000	1.89	0.577	30.5
February	108,339,000	78,482,000	41,518,000	1,307,000	1,450,000	34,632,000	12,368,000	–	61,418,000	817,000	3.25	1.316	40.5
March	53,316,000	62,200,000	46,423,000	1,174,000	2,342,000	133,609,000	939,000	–	193,371,000	2,571,000	5.35	4.587	85.7
April	133,066,000	63,218,000	44,499,000	1,031,000	2,530,000	167,170,000	1,682,000	–	147,064,000	1,956,000	1.63	3.371	207.1
May	92,778,000	67,700,000	42,339,000	1,093,000	2,316,000	102,897,000	8,239,000	–	131,806,000	1,753,000	5.39	3.126	58.0
June	99,566,000	70,340,000	42,417,000	1,183,000	2,080,000	79,923,000	21,023,000	–	117,400,000	1,561,000	8.90	2.695	30.3
July	88,652,000	73,555,000	39,864,000	1,097,000	1,481,000	44,997,000	–	18,065,000	54,277,000	722,000	3.21	1.287	40.1
August	120,965,000	68,587,000	45,245,000	1,165,000	823,000	15,426,000	16,148,000	–	26,429,000	351,000	4.85	0.627	12.9
September	93,925,000	65,585,000	46,285,000	1,162,000	919,000	35,866,000	–	6,497,000	49,395,000	657,000	4.09	1.135	27.7
October	111,735,000	73,074,000	42,287,000	1,726,000	809,000	27,187,000	–	12,258,000	20,490,000	272,000	2.28	0.486	21.3
November	103,237,000	74,087,000	41,453,000	1,113,000	897,000	36,183,000	–	22,663,000	27,833,000	370,000	1.34	0.639	47.8
December	101,984,000	79,971,000	41,323,000	1,155,000	745,000	22,120,000	–	12,568,000	30,761,000	409,000	3.42	0.730	21.4
Total	–	–	–	–	–	–	–	–	–	–	45.60	20.576	–
Av. for year	102,326,000	71,774,000	42,826,000	1,155,000	1,458,000	59,740,000	–	950,000	73,677,000	980,000	–	–	45.1

[1] Not including 224,000 gallons per day drawn from the Wachusett Aqueduct for the supply of the Westborough State Hospital, which were not discharged into Sudbury Reservoir.

TABLE NO. 5. — *Cochituate System. — Statistics of Flow of Water, Storage and Rainfall in 1922.*

[Watershed of lake = 17.58 square miles. [1]]

MONTH.	GALLONS PER DAY.									
	Water discharged through Cochituate Aqueduct.	Water diverted from Watershed by Sewers, etc.	Water wasted at Outlet of Lake.	STORAGE.		Total Yield of Watershed.	Yield per Square Mile.	Rainfall (Inches).	Rainfall collected (Inches).	Percentage of Rainfall collected.
				Gain.	Loss.					
January	–	561,000	5,445,000	981,000	–	6,987,000	397,000	1.85	0.71	38.3
February	–	629,000	14,607,000	1,171,000	–	16,407,000	933,000	3.38	1.50	44.5
March	–	1,242,000	39,565,000	2,958,000	–	43,765,000	2,489,000	5.58	4.44	79.6
April	–	1,896,000	30,012,000	–	1,102,000	30,806,000	1,752,000	1.79	3.02	168.8
May	–	1,703,000	25,326,000	381,000	–	27,410,000	1,559,000	5.06	2.78	55.0
June	–	1,897,000	32,940,000	550,000	–	35,387,000	2,013,000	10.53	3.48	33.0
July	–	1,826,000	17,400,000	–	458,000	18,768,000	1,068,000	3.06	1.91	62.2
August	–	797,000	5,948,000	2,365,000	–	9,110,000	518,000	4.11	0.92	22.5
September	–	1,108,000	18,704,000	–	3,222,000	16,590,000	944,000	4.42	1.63	36.9
October	–	981,000	10,887,000	–	2,123,000	9,745,000	554,000	2.33	0.99	42.4
November	–	780,000	12,487,000	–	4,580,000	8,687,000	494,000	1.24	0.85	68.8
December	–	587,000	6,836,000	1,048,000	–	8,471,000	482,000	3.66	0.86	23.5
Total	–	–	–	–	–	–	–	47.01	23.09	–
Average for year	–	1,168,000	18,319,000	–	159,000	19,328,000	1,099,000	–	–	49.1

[1] Not including the watersheds of Dudley and Dug ponds.

TABLE No. 6. — *Sources from which and Periods during which Water has been drawn for the Supply of the Metropolitan Water District.*

From Wachusett Reservoir into the Wachusett Aqueduct.

MONTH.	Number of Days during which Water was flowing.	ACTUAL TIME.		Million Gallons drawn.
		Hours.	Minutes.	
January	25	270	10	3,776.7
February	23	233	45	3,038.5
March	19	179	50	1,658.8
April	23	319	15	3,992.3
May	26	304	45	2,882.7
June	26	289	38	2,993.9
July	25	265	15	2,756.2
August	27	273	50	3,757.7
September	25	247	30	2,829.3
October	26	263	25	3,471.5
November	25	381	15	3,104.4
December	26	290	45	3,168.8
Totals	296	138.31 days		37,430.8

From Sudbury Reservoir through the Weston Aqueduct to Weston Reservoir.

MONTH.	Number of Days during which Water was flowing.	ACTUAL TIME.		Million Gallons drawn.
		Hours.	Minutes.	
January	25	326	29	1,247.3
February	23	302	40	1,162.5
March	27	375	46	1,439.1
April	25	427	20	1,333.1
May	26	338	5	1,312.5
June	26	325	43	1,272.5
July	25	317	50	1,235.8
August	27	375	23	1,402.6
September	25	342	27	1,390.5
October	25	335	23	1,310.9
November	25	327	30	1,243.6
December	25	332	30	1,281.0
Totals	304	171.96 days		15,631.4

From Framingham Reservoir No. 3 through the Sudbury Aqueduct to Chestnut Hill Reservoir.

MONTHS.	Number of Days during which Water was flowing.	Actual Time (Hours).	Million Gallons drawn.
January	31	744	2,625.2
February	28	672	2,197.5
March	31	744	1,928.2
April	30	719	1,893.9
May	31	744	2,098.7
June	30	720	2,110.2
July	31	744	2,280.2
August	31	744	2,126.2
September	30	721	1,970.3
October	31	744	2,265.3
November	30	720	2,222.6
December	31	744	2,479.1
Totals	365	365 days	26,197.4

TABLE NO. 7. — *Average Daily Quantity of Water flowing through Aqueducts in 1922, by Months.*[1]

MONTH.	Wachusett Aqueduct into Sudbury Reservoir (Gallons).	Weston Aqueduct into Metropolitan District (Gallons).	Sudbury Aqueduct into Chestnut Hill Reservoir (Gallons).	Cochituate Aqueduct into Chestnut Hill Reservoir (Gallons).
January	121,648,000	40,235,000	84,684,000	–
February	108,339,000	41,518,000	78,482,000	–
March	53,316,000	46,423,000	62,200,000	–
April	133,066,000	44,499,000	63,218,000	–
May	92,778,000	42,339,000	67,700,000	–
June	99,566,000	42,417,000	70,340,000	–
July	88,652,000	39,864,000	73,555,000	–
August	120,965,000	45,245,000	68,587,000	–
September	93,925,000	46,285,000	65,585,000	–
October	111,735,000	42,287,000	73,074,000	–
November	103,237,000	41,453,000	74,087,000	–
December	101,984,000	41,323,000	79,971,000	–
Average	102,326,000	42,826,000	71,774,000	–

[1] Not including quantities wasted while cleaning and repairing aqueducts.

TABLE No. 8. — (*Meter Basis.*) *Average Daily Consumption of Water by Districts in the Cities and Towns supplied by the Metropolitan Water Works in 1922.*

MONTH.	SOUTHERN LOW SERVICE. Boston, excluding East Boston and Charlestown (Gallons).	NORTHERN LOW SERVICE. Portions of Arlington, Charlestown, Chelsea, East Boston, Everett, Malden, Medford and Somerville (Gallons).	SOUTHERN HIGH SERVICE. Quincy and Watertown and Portions of Belmont, Boston and Milton (Gallons).	NORTHERN HIGH SERVICE. Melrose, Nahant, Revere, Stoneham, Swampscott and Winthrop and Portions of Chelsea, East Boston, Everett, Malden, Medford and Somerville (Gallons).	SOUTHERN EXTRA HIGH SERVICE. Portions of Boston and Milton (Gallons).	NORTHERN EXTRA HIGH SERVICE. Lexington and Portions of Arlington and Belmont (Gallons).	Total District supplied (Gallons).	Estimated Population.	Consumption per Inhabitant (Gallons).
January	43,993,100	27,671,300	44,327,000	9,350,800	786,800	981,400	127,110,400	1,252,900	101
February	42,627,800	26,484,900	43,367,300	9,174,500	806,200	958,900	123,419,600	1,255,090	98
March	39,263,500	25,346,000	40,820,000	8,873,400	789,100	988,000	116,080,000	1,257,280	92
April	40,004,700	24,204,400	39,673,600	8,893,500	838,300	1,004,900	114,619,400	1,259,480	91
May	36,144,900	25,638,100	40,558,200	9,795,900	971,300	1,049,900	114,158,300	1,261,670	90
June	38,676,500	26,530,700	42,305,500	10,330,400	1,023,000	1,063,200	119,929,300	1,263,860	95
July	37,899,700	25,900,800	42,045,400	10,665,100	921,400	976,700	118,409,100	1,266,050	93
August	39,026,900	25,751,300	42,544,900	10,730,200	926,200	1,019,800	119,999,300	1,268,240	95
September	38,503,800	25,527,000	42,082,000	10,054,500	887,100	1,030,700	118,085,100	1,270,440	93
October	40,094,500	26,173,200	42,117,500	9,540,900	981,800	1,010,700	119,918,600	1,272,630	94
November	39,634,000	26,041,200	40,731,700	8,928,000	1,005,800	863,300	117,204,000	1,274,830	92
December	41,218,700	28,590,900	41,749,000	9,107,900	921,800	852,400	122,440,700	1,277,020	96
For the year	39,739,800	26,158,600	41,855,000	9,624,900	905,400	983,400	119,267,100	1,266,050	94

In addition to the above quantities the United States Government Reservation on Peddock's Island was supplied with 17,579,000 gallons, equivalent to a daily average rate of 48,200 gallons, and a part of Saugus with 9,644,000 gallons, equivalent to a daily average rate of 26,400 gallons.

TABLE NO. 9. — (*Meter Basis.*) *Average Daily Consumption of Water in Cities and Towns supplied by the Metropolitan Water Works in 1922.*

City or town	ARLINGTON.		BELMONT.		BOSTON.		CHELSEA.		EVERETT.		LEXINGTON.		MALDEN.	
Population	19,630		11,900		781,790		44,990		42,220		6,690		51,350	
MONTH.	GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.	
	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.
January	1,075,100	55	585,500	50	93,600,000	121	3,672,300	82	3,856,700	92	428,800	65	2,586,600	51
February	1,026,600	53	594,600	51	90,849,700	117	3,588,800	80	3,718,700	89	438,600	66	2,542,500	50
March	990,000	51	624,600	53	84,146,500	108	3,324,000	74	3,568,100	85	468,900	71	2,472,600	48
April	982,100	50	633,200	54	83,363,900	107	3,152,200	70	3,412,600	81	505,300	76	2,465,700	48
May	1,180,400	60	713,000	60	80,566,800	103	3,452,400	77	3,589,200	85	461,200	69	2,615,200	51
June	1,129,600	58	698,800	59	84,995,500	109	3,498,300	78	3,658,500	87	475,700	71	2,730,900	53
July	1,083,300	55	689,600	58	83,692,100	107	3,507,300	78	3,689,500	87	429,500	64	2,732,100	53
August	1,104,500	56	698,300	58	85,361,600	109	3,452,600	77	3,543,200	84	441,100	66	2,850,700	55
September	1,062,300	54	740,200	62	84,366,000	108	3,313,000	73	3,623,100	85	469,400	70	2,904,500	56
October	1,083,500	55	725,100	60	86,280,500	110	3,391,300	75	3,695,600	87	439,800	65	2,833,700	55
November	984,300	50	685,000	57	84,505,500	107	3,240,800	72	3,598,600	85	366,600	54	2,723,000	53
December	1,008,100	51	684,800	57	89,003,900	113	3,406,400	75	3,829,600	90	357,000	53	2,904,700	56
For the year	1,059,600	54	673,200	57	85,871,000	110	3,416,500	76	3,648,900	86	440,000	66	2,698,000	53

TABLE No. 9. — *Average Daily Consumption of Water in Cities and Towns, etc.* — Continued.

City or town	MEDFORD.		MELROSE.		MILTON.		NAHANT.		QUINCY.		REVERE.	
Population	42,800		18,830		9,710		1,440		50,730		31,550	
MONTH.	GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.	
	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.
January	2,102,100	50	1,133,900	61	401,100	42	110,100	78	4,246,900	85	2,222,000	72
February	2,159,800	51	1,111,800	59	418,200	43	136,900	97	4,188,300	83	2,071,400	67
March	2,055,800	49	1,134,200	61	410,200	42	99,300	70	4,376,100	87	1,976,400	63
April	2,021,000	48	1,139,700	61	418,100	43	105,400	74	4,356,200	86	1,969,600	63
May	2,196,800	52	1,204,600	64	462,500	48	167,300	117	4,459,200	88	2,213,400	71
June	2,350,900	55	1,234,300	66	454,300	47	281,700	197	4,533,000	90	2,272,000	72
July	2,023,600	47	1,236,700	66	405,700	42	294,100	204	4,327,900	85	2,530,700	80
August	2,307,900	54	1,220,200	65	413,900	43	310,400	216	4,300,300	85	2,560,800	81
September	2,220,600	52	1,157,300	61	445,900	46	253,200	175	4,359,200	86	2,357,400	74
October	2,294,600	53	1,186,800	63	484,800	50	134,700	93	4,013,500	79	2,189,500	69
November	2,303,100	53	1,145,000	60	473,900	49	89,800	62	4,017,300	79	1,941,100	61
December	2,285,400	53	1,103,700	58	443,400	45	82,500	57	3,868,500	75	2,100,600	66
For the year	2,193,400	51	1,167,800	62	436,000	45	172,300	120	4,253,700	84	2,202,200	70

TABLE No. 9. — *Average Daily Consumption of Water in Cities and Towns, etc.* — Concluded.

City or town	SOMERVILLE.		STONEHAM.		SWAMPSCOTT.		WATERTOWN.		WINTHROP.		METROPOLITAN DISTRICT.	
Population	97,090		8,060		8,550		22,070		16,650		1,266,050	
MONTH.	GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.		GALLONS.	
	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.	Per Day.	Per Capita.
January	7,523,000	78	515,900	64	500,500	59	1,710,000	78	839,900	51	127,110,400	101
February	7,113,300	74	514,800	64	501,600	59	1,624,000	74	820,000	50	123,419,600	98
March	7,095,600	74	476,300	59	526,300	62	1,519,100	69	816,000	50	116,080,000	92
April	6,894,000	71	454,300	57	507,900	60	1,414,700	64	823,500	50	114,619,400	91
May	7,320,500	76	522,400	65	616,800	72	1,524,800	69	891,800	54	114,158,300	90
June	7,626,200	79	545,200	68	787,300	92	1,695,400	77	961,700	58	119,929,300	95
July	7,567,200	78	529,500	66	855,600	100	1,726,700	78	1,088,000	65	118,409,100	93
August	7,229,000	74	529,300	66	914,900	107	1,646,600	75	1,114,000	67	119,999,300	95
September	6,896,700	71	535,900	66	755,800	88	1,662,900	75	961,700	57	118,085,100	93
October	7,527,300	77	520,700	64	593,400	69	1,665,700	75	858,100	51	119,918,600	94
November	7,579,400	78	514,800	64	506,800	59	1,703,300	77	825,700	49	117,204,000	92
December	7,877,300	81	617,800	76	479,200	56	1,568,600	71	819,200	49	122,440,700	96
For the year	7,357,300	76	523,200	65	629,800	74	1,621,800	73	902,400	54	119,267,100	94

TABLE No. 10. — *Chemical Examinations of Water from the Wachusett Reservoir, Clinton.*

[Parts per 100,000.]

Date of Collection.		Appearance.			Odor.		Residue on Evaporation.		Ammonia.				Chlorine.	Hardness.
		Turbidity.	Sediment.	Color. Platinum Standard.	Cold.	Hot.	Total.	Loss on Ignition.	Free.	Albuminoid. Total.	Albuminoid. Dissolved.	Albuminoid. Suspended.		
Jan.	10	None.	V. slight.	.11	V. faintly vegetable.	Faintly vegetable.	3.75	1.55	.0010	.0072	.0066	.0006	.28	1.4
Jan.	24	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	4.30	1.55	.0024	.0080	.0074	.0006	.30	1.6
Feb.	7	V. slight.	V. slight.	.10	V. faintly vegetable.	V. faintly vegetable.	3.40	1.10	.0012	.0070	.0052	.0018	.20	1.4
Feb.	21	None.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.00	1.30	.0018	.0094	.0064	.0030	.28	1.4
Mar.	7	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.60	1.40	.0012	.0070	.0058	.0012	.26	1.4
Mar.	21	V. slight.	V. slight.	.10	Faintly vegetable.	Distinctly vegetable.	3.05	1.20	.0008	.0056	.0042	.0014	.24	1.3
Apr.	4	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.85	1.35	.0020	.0080	.0056	.0024	.22	1.0
Apr.	11	Slight.	Cons.	.24	V. faintly vegetable.	Faintly vegetable and unpleasant.	3.60	1.65	.0016	.0100	.0086	.0014	.14	0.6
Apr.	18	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	2.80	1.00	.0006	.0042	.0030	.0012	.18	0.6
May	2	V. slight.	V. slight.	.09	V. faintly vegetable.	Faintly vegetable.	2.85	1.30	.0010	.0084	.0072	.0012	.14	1.3
May	16	V. slight.	V. slight.	.15	V. faintly vegetable.	Faintly vegetable.	3.70	1.60	.0010	.0108	.0090	.0018	.20	1.0
June	6	V. slight.	V. slight.	.13	V. faintly vegetable.	Faintly vegetable.	3.20	1.45	.0042	.0118	.0052	.0066	.22	1.3
July	5	None.	V. slight.	.11	Faintly vegetable.	Distinctly vegetable.	3.00	1.30	.0008	.0076	.0048	.0028	.20	1.1
July	18	V. slight.	V. slight.	.18	Faintly vegetable.	Distinctly vegetable.	2.85	1.10	.0012	.0104	.0096	.0008	.24	0.8
Aug.	1	None.	V. slight.	.17	V. faintly vegetable.	Faintly vegetable.	3.25	1.70	.0012	.0082	.0068	.0014	.20	1.4
Aug.	22	V. slight.	V. slight.	.20	V. faintly vegetable.	Faintly vegetable.	3.35	1.65	.0042	.0170	.0160	.0010	.27	1.1
Sept.	5	V. slight.	V. slight.	.18	V. faintly vegetable.	Faintly vegetable.	3.45	1.35	.0026	.0102	.0078	.0024	.21	1.4
Sept.	19	V. slight.	V. slight.	.20	V. faintly vegetable.	Faintly vegetable.	–	–	.0012	.0136	.0122	.0014	.20	1.1
Oct.	3	V. slight.	Slight.	.19	V. faintly vegetable.	Faintly vegetable.	–	–	.0006	.0132	.0116	.0016	.21	1.4
Oct.	17	V. slight.	V. slight.	.14	Faintly vegetable.	Distinctly vegetable.	3.60	1.75	.0014	.0094	.0082	.0012	.26	1.1
Oct.	31	V. slight.	V. slight.	.10	V. faintly vegetable.	V. faintly vegetable.	3.00	1.40	.0010	.0070	.0064	.0006	.20	1.4
Nov.	14	None.	V. slight.	.13	V. faintly vegetable.	Faintly vegetable.	3.90	1.50	.0012	.0116	.0110	.0006	.22	1.4
Dec.	5	V. slight.	V. slight.	.10	V. faintly vegetable.	V. faintly vegetable.	3.45	1.00	.0020	.0160	.0138	.0022	.16	1.6
Av.		.....	.....	.14	.....	.....	3.38	1.39	.0016	.0096	.0079	.0017	.22	1.2

TABLE No. 11. — *Chemical Examinations of Water from the Sudbury Reservoir.*

[Parts per 100,000.]

Date of Collection.	Appearance.			Odor.		Residue on evaporation.		Ammonia.				Chlorine.	Hardness.
	Turbidity.	Sediment.	Color. Platinum Standard.	Cold.	Hot.	Total.	Loss on Ignition.	Free.	Albuminoid. Total.	Albuminoid. Dissolved.	Albuminoid. Suspended.		
Jan. 10	V. slight.	V. slight.	.15	V. faintly vegetable.	Faintly vegetable.	4.50	1.85	.0008	.0094	.0076	.0018	.26	1.8
Feb. 7	V. slight.	V. slight.	.11	Faintly vegetable.	Distinctly vegetable.	3.75	1.45	.0014	.0080	.0068	.0012	.26	1.6
Mar. 7	V. slight.	V. slight.	.12	V. faintly vegetable.	Faintly vegetable.	3.70	1.20	.0014	.0098	.0062	.0036	.26	1.3
Apr. 4	V. slight.	V. slight.	.15	V. faintly vegetable.	Faintly vegetable.	4.05	1.30	.0022	.0092	.0066	.0026	.20	1.1
May 4	V. slight.	V. slight.	.13	Faintly vegetable.	Distinctly vegetable.	3.65	1.55	.0030	.0110	.0094	.0016	.24	1.4
June 6	V. slight.	V. slight.	.17	Faintly vegetable.	Distinctly vegetable.	4.20	1.85	.0028	.0154	.0134	.0020	.30	1.3
July 5	V. slight.	V. slight.	.15	Faintly vegetable.	Distinctly vegetable.	4.00	1.80	.0010	.0098	.0082	.0016	.29	1.3
Aug. 1	V. slight.	V. slight.	.26	V. faintly vegetable.	V. faintly vegetable.	4.35	1.75	.0090	.0088	.0074	.0014	.30	1.8
Sept. 5	V. slight.	V. slight.	.18	V. faintly vegetable.	Faintly vegetable.	4.95	2.15	.0020	.0164	.0148	.0016	.32	1.6
Oct. 3	V. slight.	V. slight.	.20	V. faintly vegetable.	Faintly vegetable.	–	–	.0038	.0150	.0138	.0012	.33	1.7
Nov. 2	V. slight.	V. slight.	.19	Faintly vegetable.	Distinctly vegetable.	3.25	1.45	.0042	.0128	.0112	.0016	.27	1.6
Dec. 5	V. slight.	V. slight.	.14	V. faintly vegetable.	Faintly vegetable.	3.85	1.65	.0014	.0130	–	–	.19	1.3
Av.	.....	.....	.16	.....	.....	4.02	1.64	.0028	.0116	.0096	.0018	.27	1.3

TABLE No. 12. — *Chemical Examinations of Water from Spot Pond, Stoneham.*

[Parts per 100,000.]

Date of Collection.		Appearance.			Odor.		Residue on Evaporation.		Ammonia.				Chlorine.	Hardness.
		Turbidity.	Sediment.	Color. Platinum Standard.	Cold.	Hot.	Total.	Loss on Ignition.	Free.	Albuminoid. Total.	Albuminoid. Dissolved.	Albuminoid. Suspended.		
Jan.	16	V. slight.	None.	.10	Faintly vegetable.	Faintly vegetable.	4.50	1.60	.0006	.0084	.0064	.0020	.35	1.3
Feb.	13	V. slight.	V. slight.	.05	V. faintly vegetable.	Faintly vegetable.	5.40	2.35	.0012	.0114	.0100	.0014	.32	1.8
Mar.	13	V. slight.	V. slight.	.05	Faintly vegetable.	Distinctly vegetable.	3.25	1.10	.0014	.0070	.0060	.0010	.25	1.3
Apr.	10	V. slight.	V. slight.	.08	V. faintly vegetable.	Faintly vegetable.	3.65	1.60	.0008	.0118	.0102	.0016	.29	1.7
May	8	V. slight.	Slight.	.02	V. faintly vegetable.	Faintly vegetable.	3.50	1.35	.0004	.0106	.0078	.0028	.30	1.4
June	21	V. slight.	V. slight.	.05	V. faintly vegetable.	Faintly vegetable.	3.30	1.20	.0008	.0096	.0084	.0012	.25	1.4
July	10	V. slight.	V. slight.	.05	V. faintly vegetable.	Faintly vegetable.	3.65	1.65	.0012	.0070	.0068	.0002	.28	1.4
July	31	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.70	1.30	.0016	.0098	.0076	.0022	.28	1.3
Sept.	11	V. slight.	V. slight.	.08	Faintly vegetable and unpleasant.	Dist. vegetable and unpleasant.	4.15	1.60	.0020	.0148	.0102	.0046	.32	1.6
Nov.	6	None.	V. slight.	.08	V. faintly vegetable.	Faintly vegetable.	3.65	1.25	.0030	.0150	.0112	.0038	.28	1.6
Av.		.....	.....	.07	.....	.....	3.88	1.50	.0013	.0105	.0085	.0021	.29	1.5

TABLE No. 13. — *Chemical Examinations of Water from Lake Cochituate.*

[Parts per 100,000.]

Date of Collection.	Appearance.			Odor.		Residue on Evaporation.		Ammonia.				Chlorine.	Hardness.
	Turbidity.	Sediment.	Color. Platinum Standard.	Cold.	Hot.	Total.	Loss on Ignition.	Free.	Albuminoid. Total.	Albuminoid. Dissolved.	Albuminoid. Suspended.		
Jan. 9	V. slight.	V. slight.	.12	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	7.25	2.00	.0002	.0226	.0138	.0088	.69	2.7
Feb. 6	V. slight.	Slight.	.17	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	7.80	2.70	.0008	.0226	.0122	.0104	.66	3.1
Mar. 8	Slight.	V. slight.	.20	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	7.65	2.80	.0020	.0182	.0144	.0038	.76	2.9
Apr. 3	V. slight.	Slight.	.20	Faintly vegetable and marshy.	Distinctly vegetable and marshy.	7.30	2.75	.0014	.0090	.0086	.0004	.53	2.9
May 3	V. sl. iron.	Slight iron	.12	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	6.55	2.15	.0018	.0198	.0142	.0056	.54	2.7
June 7	V. slight.	Slight.	.13	Faintly vegetable and sweetish.	Distinctly vegetable and sweetish.	6.60	2.15	.0006	.0132	.0090	.0042	.62	1.7
July 5	V. slight.	Slight.	.16	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	6.25	2.40	.0020	.0120	.0088	.0032	.60	2.5
Aug. 2	None.	V. slight.	.16	Very faintly vegetable.	Faintly vegetable.	6.15	2.15	.0002	.0140	.0114	.0026	.63	2.3
Sept. 6	V. slight.	V. slight.	.20	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	8.25	2.60	.0006	.0210	.0140	.0070	.60	2.5
Oct. 4	V. slight.	Slight.	.22	Faintly vegetable and marshy.	Distinctly vegetable and marshy.	–	–	.0014	.0108	.0096	.0012	.60	2.6
Nov. 1	Slight.	Slight.	.17	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	7.00	2.25	.0006	.0312	.0184	.0128	.62	2.6
Dec. 4	V. slight.	Slight.	.13	Faintly vegetable and earthy.	Distinctly vegetable and earthy.	6.75	2.50	.0062	.0424	.0182	.0242	.62	2.7
Av.	.....	.....	.17	.....	.....	7.05	2.40	.0015	.0197	.0127	.0070	.62	2.6

TABLE No. 14. — *Chemical Examinations of Water from a Tap at the State House, Boston.*

[Parts per 100,000.]

Date of Collection.	Appearance.			Odor.		Residue on Evaporation.		Ammonia.				Chlorine.	Hardness.
	Turbidity.	Sediment.	Color. Platinum Standard.	Cold.	Hot.	Total.	Loss on Ignition.	Free.	Albuminoid. Total.	Albuminoid. Dissolved.	Albuminoid. Suspended.		
Jan. 9	V. slight.	V. slight.	.14	V. faintly vegetable.	Faintly vegetable.	4.00	1.20	.0004	.0102	.0092	.0010	.36	1.6
Feb. 8	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.60	1.35	.0008	.0108	.0076	.0032	.34	2.1
Mar. 8	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.75	1.75	.0018	.0074	.0064	.0010	.33	1.8
Apr. 4	V. slight.	V. slight.	.15	Faintly unpleasant and fishy.	Distinctly unpleasant and fishy.	3.90	1.40	.0006	.0078	.0058	.0020	.28	2.1
May 2	V. slight.	V. slight.	.10	V. faintly vegetable.	Faintly vegetable.	3.75	1.15	.0012	.0094	.0088	.0006	.28	2.3
June 5	V. slight.	Slight.	.19	Faintly vegetable.	Distinctly vegetable.	3.95	1.50	.0012	.0098	.0078	.0020	.30	1.8
July 5	V. slight.	V. slight.	.18	V. faintly vegetable.	Faintly vegetable.	4.35	2.15	.0004	.0094	.0076	.0018	.29	1.7
July 30	V. slight.	V. slight.	.23	V. faintly vegetable.	Faintly vegetable.	4.00	1.50	.0002	.0066	.0058	.0008	.26	1.7
Sept. 5	V. slight.	V. slight.	.18	V. faintly vegetable.	Faintly vegetable.	4.00	1.35	.0032	.0102	.0094	.0008	.25	1.6
Oct. 3	V. slight.	V. slight.	.20	V. faintly unpleasant and fishy.	Faintly unpleasant and fishy.	–	–	.0010	.0100	.0076	.0024	.28	1.7
Nov. 1	V. slight.	V. slight.	.20	V. faintly vegetable.	Faintly vegetable.	4.00	1.85	.0006	.0112	.0094	.0018	.30	1.4
Dec. 2	V. slight.	V. slight.	.15	V. faintly vegetable.	Faintly vegetable.	4.50	1.90	.0016	.0136	.0110	.0026	.28	1.7
Av.	.....	.....	.16	.....	.....	3.98	1.55	.0011	.0097	.0080	.0017	.30	1.8

TABLE NO. 15. — *Chemical Examinations of Water from a Faucet in Boston, 1892–1922.*

[Parts per 100,000.]

YEAR.	COLOR.	RESIDUE ON EVAPORATION.		AMMONIA.				CHLORINE.	OXYGEN CONSUMED.	HARDNESS.
					ALBUMINOID.					
	Platinum Standard.	Total.	Loss on Ignition.	Free.	Total.	Dissolved.	Suspended.			
1892	.37	4.70	1.67	.0007	.0168	.0138	.0030	.41	–	1.9
1893	.53	4.54	1.84	.0010	.0174	.0147	.0027	.38	.60	1.8
1894	.58	4.64	1.83	.0006	.0169	.0150	.0019	.41	.63	1.7
1895	.59	4.90	2.02	.0006	.0197	.0175	.0022	.40	.69	0.7
1896	.45	4.29	1.67	.0005	.0165	.0142	.0023	.37	.56	1.4
1897	.55	4.82	1.84	.0009	.0193	.0177	.0016	.40	.64	1.6
1898	.40	4.19	1.60	.0008	.0152	.0136	.0016	.29	.44	1.4
1899	.28	3.70	1.30	.0006	.0136	.0122	.0014	.24	.35	1.1
1900	.29	3.80	1.20	.0012	.0157	.0139	.0018	.25	.38	1.3
1901	.29	4.43	1.64	.0013	.0158	.0142	.0016	.30	.42	1.7
1902	.30	3.93	1.56	.0016	.0139	.0119	.0020	.29	.40	1.3
1903	.29	3.98	1.50	.0013	.0125	.0110	.0015	.30	.39	1.5
1904	.23	3.93	1.59	.0023	.0139	.0121	.0018	.34	.37	1.5
1905	.24	3.86	1.59	.0020	.0145	.0124	.0021	.35	.35	1.4
1906	.24	3.86	1.39	.0018	.0159	.0134	.0025	.34	.36	1.3
1907	.22	3.83	1.40	.0013	.0129	.0109	.0020	.33	.32	1.3
1908	.19	3.50	1.35	.0011	.0115	.0092	.0024	.33	.26	1.2
1909	.18	3.46	1.43	.0011	.0128	.0103	.0025	.28	.25	1.3
1910	.14	3.05	1.24	.0013	.0118	.0102	.0016	.28	.22	1.1
1911	.25	4.18	1.66	.0015	.0156	.0128	.0029	.38	.33	1.4
1912	.17	3.86	1.23	.0018	.0154	.0119	.0034	.36	.29	1.7
1913	.13	3.96	1.15	.0014	.0150	.0120	.0026	.35	.26	1.5
1914	.14	4.12	1.19	.0014	.0138	.0116	.0022	.39	.25	1.4
1915	.16	3.73	1.04	.0015	.0157	.0134	.0023	.38	.25	1.4
1916	.18	4.53	1.85	.0013	.0133	.0107	.0026	.36	–	1.4
1917	.15	4.45	1.68	.0015	.0142	.0124	.0018	.33	–	1.3
1918	.18	3.89	1.45	.0019	.0154	.0128	.0026	.29	–	1.4
1919	.20	4.28	1.41	.0010	.0130	.0108	.0022	.36	–	1.5
1920	.17	4.23	1.35	.0012	.0112	.0097	.0014	.33	–	1.5
1921	.13	3.80	1.39	.0006	.0104	.0089	.0015	.25	–	1.4
1922	.16	3.98	1.55	.0011	.0097	.0080	.0017	.30	–	1.8

TABLE No. 16. — *Number of Bacteria per Cubic Centimeter in Water from Various Parts of the Metropolitan Water Works, 1898–1922.*

[Averages of weekly determinations.]

YEAR.	CHESTNUT HILL RESERVOIR.			SOUTHERN SERVICE TAPS.	
	Sudbury Aqueduct Terminal Chamber.	Cochituate Aqueduct.	Effluent Gate-house No. 2.	Low Service, 180 Boylston Street.	High Service, 1 Ashburton Place.
1898	207	145	111	96	–
1899	224	104	217	117	123
1900	248	113	256	188	181
1901	225	149	169	162	168
1902	203	168	121	164	246
1903	76	120	96	126	243
1904	347	172	220	176	355
1905	495	396	489	231	442
1906	231	145	246	154	261
1907	147	246	118	130	176
1908	162	138	137	136	148
1909	198	229	119	150	195
1910	216	–	180	178	213
1911	205	204	151	175	197
1912	429	450	227	249	259
1913	123	243	157	119	140
1914	288	–	252	174	220
1915	163	–	128	117	134
1916	128	–	85	102	105
1917	178	112	119	119	141
1918	1,163	168	705	317	544
1919	92	85	100	70	84
1920	148	86	108	113	112
1921	103	–	83	92	92
1922	163	–	153	160	172

TABLE No. 17. — *Colors of Water from Various Parts of the Metropolitan Water Works in 1922. (Averages of Weekly Determinations.)*

[Platinum Standard.]

MONTH.	WACHUSETT RESERVOIR.						SUDBURY RESERVOIR.				FRAMINGHAM RESERVOIR No. 3.	LAKE COCHITUATE.			CHESTNUT HILL RESERVOIR.			SPOT POND.	FELLS RESERVOIR.	NORTHERN SERVICE.		SOUTHERN SERVICE.	
	Surface.	Mid-depth.	Bottom.	Worcester Street Bridge.	Quinapoxet River.	Stillwater River.	Surface.	Mid-depth.	Bottom.	End of Open Channel.	Mid-depth.	Surface.	Mid-depth.	Bottom.	Inlet (Sudbury Aqueduct).	Inlet (Cochituate Aqueduct).	Effluent Gate-house No. 2.	Mid-depth.	Effluent Gate-house.	Tap at Glenwood Yard, Medford (Low Service).	Tap at Fire Station, Hancock Street, Everett (High Service).	Tap at 180 Boylston Street, Boston (Low Service).	Tap at 1 Ashburton Place, Boston (High Service).
January	11	11	11	30	33	30	13	14	14	14	14	14	14	22	13	–	13	8	8	14	7	14	13
February	11	12	12	27	30	26	13	14	13	12	14	16	15	40	14	–	13	10	10	13	10	13	14
March	11	11	11	29	33	27	13	13	14	16	14	23	–	–	14	–	13	10	10	13	10	13	13
April	12	12	12	28	33	28	16	16	16	19	16	20	20	21	16	–	14	10	10	14	10	14	14
May	13	13	13	38	40	37	16	16	16	15	16	16	16	22	16	–	15	11	10	15	10	15	15
June	14	14	14	33	50	48	16	16	16	23	16	17	16	36	16	–	15	10	10	15	10	15	16
July	14	14	14	34	50	44	19	22	20	20	20	22	31	64	19	–	17	11	10	16	10	17	18
August	21	21	19	35	64	52	24	24	27	23	24	22	22	207	23	–	22	14	13	23	13	23	23
September	21	22	20	26	69	62	25	26	27	36	26	26	26	272	26	–	24	16	16	25	16	24	24
October	19	18	18	20	57	40	20	20	23	19	20	26	32	204	20	–	19	15	13	24	14	19	19
November	14	14	14	16	41	32	16	17	16	16	17	18	18	17	16	–	15	11	11	16	11	15	16
December	14	14	15	33	36	27	17	17	17	16	17	17	18	20	17	–	16	11	12	17	12	17	17
Averages	15	15	14	29	45	38	17	18	18	18	18	20	21	84	18	–	16	11	11	17	11	17	17

TABLE No. 18. — *Temperatures of Water from Various Parts of the Metropolitan Water Works in 1922.* (*Averages of Weekly Determinations.*)

[The temperatures are taken at the same places and times as the samples for microscopical examination; the depth at place of observation is from high-water mark.]

[Degrees Fahrenheit.]

Month.	Wachusett[1] Reservoir (Depth at Place of Observation 107 Feet).			Sudbury[1] Reservoir (Depth at Place of Observation 54.5 Feet).			Wachusett Aqueduct.	Framingham[1] Reservoir No. 3 (Depth at Place of Observation 20.5 Feet).			Lake Cochituate[1] (Depth at Place of Observation 62.0 Feet).			Chestnut Hill Reservoir.	Spot Pond[1] (Depth at Place of Observation 28.0 Feet).			Northern Service.		Southern Service.	
	Surface.	Mid-depth.	Bottom.	Surface.	Mid-depth.	Bottom.	End of Open Channel.	Surface.	Mid-depth.	Bottom.	Surface.	Mid-depth.	Bottom.	Effluent Gate-house No. 2.	Surface.	Mid-depth.	Bottom.	Tap at Glenwood Yard, Medford (Low Service).	Tap at Fire Station, Hancock Street, Everett (High Service).	Tap at 180 Boylston Street, Boston (Low Service).	Tap at 1 Ashburton Place, Boston (High Service).
January	33.7	33.9	34.8	33.0	34.3	35.5	34.0	33.6	34.6	34.7	34.1	35.7	37.0	35.4	33.8	34.0	34.7	38.8	38.7	36.7	36.8
February	34.1	34.7	35.8	33.6	35.5	36.5	34.8	34.1	34.9	35.8	34.2	36.5	38.0	36.8	35.5	36.0	36.5	39.1	39.1	37.7	38.1
March	36.1	36.9	36.3	36.1	37.0	38.8	35.5	36.6	37.5	37.7	37.7	–	–	38.6	38.1	37.8	38.8	41.0	40.8	39.1	39.6
April	39.4	39.5	39.5	45.3	43.5	43.8	41.3	43.3	43.6	43.9	45.5	43.2	42.0	46.4	44.4	44.7	45.1	46.3	45.5	46.7	47.0
May	54.4	50.6	49.7	59.6	57.5	54.0	51.7	60.5	59.7	58.1	56.0	50.6	47.6	59.2	58.1	59.3	56.2	57.0	57.4	58.0	58.9
June	66.1	59.9	53.8	69.6	67.0	60.3	55.5	68.6	66.7	65.1	69.0	52.7	48.0	68.4	69.5	70.3	64.0	67.0	67.8	68.2	68.6
July	75.9	63.7	55.8	73.9	69.3	65.3	58.0	74.4	72.5	69.5	75.1	52.9	47.9	72.8	74.3	74.5	68.0	70.3	71.5	72.0	72.0
August	73.9	68.0	52.1	72.9	70.5	67.7	57.5	73.3	71.0	70.5	73.0	54.1	48.4	72.9	73.1	72.0	71.5	70.5	71.5	72.3	72.5
September	71.3	67.0	54.0	70.2	69.0	68.0	65.0	71.3	71.0	70.5	71.0	53.5	48.1	69.8	69.2	68.5	69.3	68.8	69.3	69.6	69.9
October	60.5	59.5	56.0	60.4	60.5	63.5	55.0	58.8	58.7	–	59.5	52.4	47.9	59.8	60.1	64.0	58.3	62.8	62.0	60.8	60.9
November	48.0	46.5	49.2	45.0	44.3	47.0	41.8	43.6	42.0	45.3	46.4	46.5	45.4	45.7	45.1	46.8	43.3	50.5	48.8	47.2	47.4
December	37.0	36.4	41.5	35.5	35.0	39.5	34.5	34.5	35.0	34.5	35.7	38.5	38.8	35.8	35.5	38.0	35.0	42.5	41.0	38.1	38.3
Averages	52.5	49.7	46.5	52.9	52.0	51.7	47.1	52.6	52.3	51.4	53.1	47.0	44.5	53.5	53.1	53.8	51.7	54.6	54.5	53.9	54.2

[1] Surface temperatures are averages of weekly determinations. Mid-depth and bottom temperatures are averages of biweekly determinations.

TABLE NO. 19. — *Length of Metropolitan Water Works Main Lines and Connections and Number of Valves set in Same, Dec. 31, 1922.*

[Pipes are of cast iron unless otherwise noted.]

	DIAMETER OF PIPES IN INCHES.															Total.
	60	48	42	40	36	30	24	20	16	14	12	10	8	6	4	
Total length owned and operated Dec. 31, 1921 (feet)	43,802	211,092	9,810	6,887	63,626	49,804	85,510	85,719	74,256	26	29,150	3,853	1,890	994	33	666,452
Gate valves in same	5	56	1	3	60	45	62	56	87	1	118	22	19	23	1	559
Air valves in same	51	125	5	5	47	22	43	51	38	–	10	1	–	–	–	398
Length laid or relaid during 1922 (feet)	–	–	–	–	–	1,337	10,549	14,186	86	–	–	–	–	92	5	26,255
Gate valves in same	–	–	–	–	–	–	5	5	4	–	–	–	–	2	–	16
Air valves in same	–	–	–	–	–	2	10	11	–	–	–	–	–	–	–	23
Length abandoned during 1922 (feet)	–	–	–	–	–	–	3	–	15	–	–	–	–	74	–	92
Gate valves in same	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	2
Air valves in same	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Length owned and operated Dec. 31, 1922 (feet)	43,802[1]	211,092	9,810	6,887	63,626	51,141[2]	96,056	99,905	74,327	26	29,150	3,853	1,890	1,012	38	692,615[3]
Gate valves in same	5	56	1	3	60	45	67	61	91	1	118	22	19	23	1	573
Air valves in same	51	125	5	5	47	24	53	62	38	–	10	1	–	–	–	421

[1] Includes 2,035 feet of 76-inch concrete-lined pressure tunnel; 363 feet of 76-inch mortar-lined and concrete-covered steel pipe; 21 feet of 76-inch cast-iron pipe and 85 feet of 60-inch concrete-covered steel pipe.

[2] Includes 15,512 feet of 30-inch mortar-lined and covered wrought-iron pipe.

[3] 131.18 miles.

TABLE No. 20. — *Length of Metropolitan Water Works Hydrant, Blow-off and Drain Pipes, Dec. 31, 1922.*

[All pipes are of cast iron.]

	Diameter of Pipes in Inches.								Total.
	24	20	16	12	10	8	6	4	
Total length in use Dec. 31, 1921 (feet)	352	292	3,121	6,882	176	513	3,600	1,569	16,505
Valves in same	–	–	30	109	2	9	86	46	282
Length laid or relaid in 1922 (feet)	–	–	–	54	–	32	413	–	499
Valves in same	–	–	–	1	–	–	10	–	11
Length abandoned in 1922 (feet)	–	–	–	32	–	–	32	–	64
Valves in same	–	–	–	–	–	–	–	–	–
Total length in use Dec. 31, 1922 (feet)	352	292	3,121	6,904	176	545	3,981	1,569	16,940 [1]
Valves in same	–	–	30	110	2	9	96	46	293

[1] 3.21 miles.

TABLE No. 21. — *Length of Metropolitan Water Works Main Lines and Connections and Water Pipes, Four Inches in Diameter and Larger, in the Several Cities and Towns supplied by the Metropolitan Water Works, Dec. 31, 1922.*

By whom owned.	Inches.																	Totals.	
	60	48	42	40	36	30	24	20	18	16	14	12	10	8	7	6	4	Feet.	Miles.
Metropolitan Water Works	43,802	211,092	9,810	6,887	63,626	51,141	96,056	99,905	–	74,327	26	29,150	3,853	1,890	–	1,012	38	692,615	131.18
Arlington	–	–	–	–	–	–	–	–	–	–	–	25,208	30,408	41,153	–	165,683	14,497	276,949	52.45
Belmont	–	–	–	–	–	–	–	–	–	–	–	5,714	21,127	29,689	–	131,126	269	187,925	35.59
Boston	–	10,607	15,683	16,081	41,805	93,331	77,993	86,520	–	274,307	5,041	1,499,877	432,560	855,317	–	1,155,352	96,533	4,661,007	882.76
Chelsea	–	–	–	–	–	–	–	–	–	5,176	–	5,479	39,826	31,875	–	146,938	6,747	236,041	44.70
Everett	–	–	–	–	–	–	2,484	2,900	–	5,204	5,998	6,084	43,451	25,985	–	148,496	30,600	271,202	51.36
Lexington	–	–	–	–	–	–	–	–	–	–	–	10,521	5,011	36,329	–	130,589	28,026	210,476	39.86
Malden	–	–	–	–	–	–	–	–	–	8,891	11,115	85,648	31,336	94,568	–	225,865	50,869	508,292	96.27
Medford	–	–	–	–	–	–	–	673	–	6,775	9,598	33,621	40,019	101,040	–	177,743	26,725	396,194	75.04
Melrose	–	–	–	–	–	–	–	–	–	5,223	3,024	23,097	20,334	25,731	–	159,389	54,368	291,166	55.15
Milton	–	–	–	–	–	–	–	–	–	103	44	22,808	20,926	56,124	–	165,626	17,646	283,277	53.65
Nahant	–	–	–	–	–	–	–	–	–	–	4,000	150	11,550	4,800	–	36,800	57,416	114,716	21.73
Quincy	–	–	–	–	–	–	–	2,679	–	23,232	–	32,848	51,567	160,757	994	391,239	91,737	755,053	143.00
Revere[1]	–	–	–	–	–	–	–	–	–	23,800	6,970	29,185	29,995	36,374	–	117,018	71,179	314,521	59.57
Somerville	–	–	–	–	–	–	–	4,210	367	4,135	7,950	96,814	59,882	110,616	–	213,653	21,186	518,813	98.26
Stoneham	–	–	–	–	–	–	–	–	–	–	–	7,425	1,825	5,110	–	109,656	18,797	142,813	27.05
Swampscott	–	–	–	–	–	–	–	–	–	–	3,045	6,714	20,146	6,593	–	94,136	8,824	139,458	26.41
Watertown	–	–	–	–	–	–	–	–	–	2,991	11,877	5,959	25,614	29,286	–	137,744	11,816	225,287	42.67
Winthrop	–	–	–	–	–	–	–	–	–	–	–	4,049	24,198	36,723	–	56,473	54,895	176,338	33.40
Total feet	43,802	221,699	25,493	22,968	105,431	144,472	176,533	196,887	367	434,164	68,688	1,930,351	913,628	1,689,960	994	3,764,538	662,168	10,402,143	–
Total miles	8.30	41.99	4.83	4.35	19.97	27.36	33.43	37.29	0.07	82.23	13.01	365.59	173.03	320.07	0.19	712.98	125.41	–	1,970.10

[1] Includes small portion of Saugus.

TABLE No. 22. — *Number of Service Pipes, Meters, Per Cent of Services metered, Fire Services and Fire Hydrants in the Several Cities and Towns supplied by the Metropolitan Water Works, Dec. 31, 1922.*

CITY OR TOWN.	Services.	Meters.	Per Cent of Services metered.	Services used for Fire Purposes only.	Fire Hydrants.
Arlington	3,643	3,643	100.00	19	548
Belmont	2,263	2,263	100.00	3	285
Boston	107,543	75,125	69.86	2,138	9,887
Chelsea	5,364	5,333	99.42	73	411
Everett	6,220	4,958	79.71	28	652
Lexington	1,473	1,460	99.12	6	237
Malden	8,639	8,240	95.38	57	609
Medford[1]	–	–	–	–	–
Melrose	4,420	4,408	99.73	20	393
Milton	2,443	2,443	100.00	1	468
Nahant	846	615	72.70	1	105
Quincy	11,812	10,660	90.25	19	1,318
Revere[2]	5,227	4,409	84.35	5	331
Somerville	13,895	11,568	83.25	55	1,260
Stoneham	1,724	1,724	100.00	–	158
Swampscott	2,096	2,096	100.00	6	222
Watertown	3,626	3,626	100.00	25	441
Winthrop	3,103	3,089	99.55	5	335
Totals	–	–	–	–	–

[1] Information for Medford not available.
[2] Includes small portion of Saugus.

TABLE NO. 23. — *Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base for Each Month at Stations on Metropolitan Water Works during 1922.*

1922. MONTH.	LOW SERVICE.												SOUTHERN HIGH SERVICE.					
	BOSTON ENGINE HOUSE, BULFINCH STREET.		ALLSTON ENGINE HOUSE, HARVARD STREET.		MEDFORD, NEAR MYSTIC RESERVOIR.		SOMERVILLE PUBLIC LIBRARY, HIGHLAND AVENUE.		MALDEN WATER WORKS SHOP, GREEN STREET.		CHELSEA COURT HOUSE.		BOSTON METROPOLITAN WATER WORKS OFFICE, 1 ASHBURTON PLACE.		WATERTOWN WATER WORKS OFFICE, MAIN STREET.		BELMONT WATER WORKS SHOP, WAVERLEY STREET.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
January	157	127	182	170	168	161	167	160	163	156	159	146	250	227	263	254	261	243
February	155	134	181	168	168	162	167	160	163	156	160	146	250	227	263	255	261	236
March	157	134	179	168	167	159	167	158	164	156	158	146	250	227	263	256	263	241
April	157	134	182	168	168	160	169	158	164	156	161	146	250	229	263	255	261	241
May	157	141	182	168	168	160	169	158	164	156	161	146	250	224	263	249	261	224
June	157	139	179	167	167	160	167	158	165	156	158	145	248	222	263	243	259	215
July	157	139	179	168	168	158	169	158	165	156	162	146	248	222	263	243	257	224
August	158	137	179	168	168	159	169	158	165	156	162	146	248	222	263	244	261	222
September	157	137	179	167	167	160	167	157	163	156	159	145	250	222	263	249	261	226
October	157	134	179	168	–[1]	–[1]	167	158	163	156	158	145	250	224	263	247	257	220
November	157	139	179	168	–[1]	–[1]	167	158	163	156	158	148	250	227	263	251	261	231
December	157	134	179	167	–[1]	–[1]	167	158	163	156	158	145	250	227	263	251	257	231
Averages	157	136	180	168	168	160	168	158	164	156	160	146	250	225	263	250	260	230

[1] Gage out of order.

TABLE No. 23. — *Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base, etc.* — Concluded.

1922. MONTH.	SOUTHERN HIGH SERVICE — Concluded.						NORTHERN HIGH SERVICE.										NORTHERN EXTRA HIGH SERVICE.	
	MILTON WATER WORKS OFFICE, ADAMS STREET.		FORBES HILL TOWER, QUINCY.		QUINCY WATER WORKS SHOP.		SOMERVILLE PUMPING STATION, CEDAR STREET.		MALDEN CITY HALL.		REVERE WATER WORKS SHOP, BROADWAY.		LYNN ENGINE HOUSE, UNION SQUARE.		WINTHROP TOWN HALL, HERMAN STREET.		LEXINGTON[1] TOWN HALL, MASSACHUSETTS AVENUE.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
January	247	223	244	227	237	207	268	236	269	260	265	237	261	229	194	173	439	418
February	248	224	245	225	239	209	268	237	269	262	265	246	259	236	195	173	439	416
March	248	224	246	227	233	209	268	236	269	258	265	244	259	236	194	173	439	418
April	248	224	246	227	235	209	268	233	269	260	265	241	261	227	194	173	444	425
May	248	223	244	225	235	205	268	229	269	260	269	230	254	190	191	171	444	423
June	247	222	245	223	239	204	267	215	267	253	265	221	238	169	189	161	444	409
July	248	221	243	227	239	204	266	226	269	256	262	235	236	194	188	164	444	421
August	247	221	243	223	239	203	266	236	269	257	269	230	231	183	189	161	444	409
September	247	223	243	223	242	205	266	231	269	258	267	241	240	206	188	168	444	421
October	247	223	243	225	242	205	268	225	269	258	267	241	250	213	191	173	444	421
November	248	224	246	225	242	209	268	231	269	262	267	237	252	213	194	173	444	425
December	247	223	245	224	242	209	268	231	269	260	269	246	252	222	196	171	439	415
Averages	248	223	244	225	239	207	267	231	269	259	266	237	249	210	192	170	442	418

[1] Arlington standpipe out of service from Mar. 27 to Nov. 11.

Appendix No. 3.

FINANCIAL STATEMENT PRESENTED TO THE GENERAL COURT ON JANUARY 16, 1923.

The Metropolitan District Commissioner respectfully presents the following abstract of the account of the receipts, expenditures, disbursements, assets and liabilities of the Metropolitan District Commission for the year ending November 30, 1922, together with recommendations for legislation which it deems desirable, in accordance with the provisions of section 100 of chapter 92 of the General Laws.

Metropolitan Water Works.

Construction.

The loans authorized for expenditures under the Metropolitan Water acts, the receipts which are added to the loan fund, the expenditures for the construction and acquisition of works, and the balance available on December 1, 1922, have been as follows: —

Loans authorized under Metropolitan Water acts, including appropriations under St. 1920, c. 530, to provide for the reinforcement of the low-service and the northern high-service pipe lines, the construction of a reservoir in Arlington for the northern extra high service, to provide additional pumping machinery for the northern high service at Spot Pond and the southern high service at Chestnut Hill pumping stations		$45,685,000 00
Receipt from town of Swampscott for admission to Metropolitan Water District, paid into loan fund (St. 1909, c. 320)		90,000 00
Receipts from the sales of property which are placed to the credit of the Metropolitan Water Loan Fund: —		
For the year ending November 30, 1922	$5,144 57	
For the period prior to December 1, 1921	271,833 72	
		276,978 29
		$46,051,978 29
Amount approved for payment from the Metropolitan Water Loan Fund: —		
For the year ending November 30, 1922	$348,304 01	
For the period prior to December 1, 1921	43,413,566 18	
		43,761,870 19
Balance December 1, 1922		$2,290,108 10

The amount of the Metropolitan Water Loan bonds issued at the end of the fiscal year was $43,447,000, bonds to the amount of $500,000 having been issued during the year. Of the total amount issued, $41,398,000 were sinking fund bonds, and the remainder, amounting to $2,049,000, was issued as serial bonds.

At the end of the year the amount of outstanding bonds was $43,138,000, as bonds issued on the serial payment plan to the amount of $309,000 had been paid. During the fiscal year $44,000 in serial bonds has been paid.

The Metropolitan Water Loan Sinking Fund amounted on December 1, 1922, to $19,230,940.55, an increase during the year of $1,083,926.34.

Maintenance.

Amount appropriated for the maintenance and operation of works, for the year ending November 30, 1922	$784,800 00	
Receipts credited to this fund for the year ending November 30, 1922	4,928 44	
		$789,728 44
Amount approved for maintenance and operation of works during the year ending November 30, 1922	$776,694 69	
Deduct amount paid from appropriation for the year 1921	45,540 27	
		731,154 42
Balance December 1, 1922		$58,574 02

The Commission has also received during the year ending November 30, 1922, $95,502.54 from rentals, the sale of land, land products and power and from other proceeds from the operations of the Metropolitan Water Works, which, according to section 18 of the Metropolitan Water Act, are applied by the Treasurer of the Commonwealth to the payment of interest on the Metropolitan Water Loan, to sinking fund requirements and expenses of maintenance and operation of works, in reduction of the amount to be assessed upon the Metropolitan Water District for the year.

Sums received from sales of water to municipalities not belonging to the District and to water companies, and from municipalities for admission to the District, have been applied as follows: —

For the period prior to December 1, 1906, distributed to the cities and towns of the District, as provided by section 3 of the Metropolitan Water Act	$219,865 65
For the period beginning December 1, 1906, and prior to December 1, 1921, applied to the Metropolitan Water Loan Sinking Fund, as provided by chapter 238 of the Acts of 1907	115,634 87
For the year beginning December 1, 1921, and ending November 30, 1922, applied to the Metropolitan Water Loan Sinking Fund, as provided by said last-named act	8,075 57
	$343,576 09

It appears from the foregoing financial statement that on December 1, 1922, the balance remaining unexpended on account of the amount of the Metropolitan Water Loan Fund, authorized for the construction and acquisition of works, was $2,290,108.10. This balance consists principally of the amounts remaining for the improvement of Beaver Dam Brook, the construction of a supply main from the terminal chamber of the Weston aqueduct to a point near the old Mystic pumping station, the construction of a northern extra high-service reservoir in Arlington and additional pumping machinery for Spot Pond pumping station.

Metropolitan Sewerage Works.

Construction.

The loans authorized under the various acts of the Legislature for the construction of the Metropolitan Sewerage Works, the receipts which are added to the proceeds of the loans, and the expenditures for construction, are given below, as follows: —

NORTH METROPOLITAN SYSTEM.

Loans authorized for expenditures for construction under the various acts, including those for the Revere, Belmont and Malden extensions, North System enlargement and extensions, new Mystic sewer, Deer Island outfall extension, lowering sewer siphon under Malden River, balance of appropriation under chapter 76, Resolves of 1915, for the Reading extension and for the new Mystic sewer in Woburn and Winchester under chapter 529, Acts of 1922	$7,662,365 73	
Receipts from sales of real estate and from miscellaneous sources, which are placed to the credit of the North Metropolitan System: —		
For the year ending November 30, 1922	282 00	
For the period prior to December 1, 1921	87,422 16	
		$7,750,069 89
Amount approved for payment from the Metropolitan Sewerage Loan Fund, North System: —		
For the year ending November 30, 1922	$1,971 92	
For the period prior to December 1, 1921	7,572,580 11	
		7,574,552 03
Balance December 1, 1922		$175,517 86

SOUTH METROPOLITAN SYSTEM.

Loans authorized for expenditures for construction under the various acts, applied to the construction of the Charles River valley sewer, Neponset valley sewer, high-level sewer and extensions (including Wellesley Branch) and an additional appropriation authorized by chapter 525, Acts of 1920, for additional Ward Street station pumping plant, a new force main from the Quincy station, a new pump and other equipment at the Quincy station and an additional appropriation for the Wellesley extension, authorized under chapter 529, Acts of 1922	$9,992,046 27	
Receipts for pumping, sales of real estate and from miscellaneous sources, which are placed to the credit of the South Metropolitan System: —		
For the year ending November 30, 1922	1 08	
For the period prior to December 1, 1921	24,637 40	
		$10,016,684 75
Amount approved for payment from the Metropolitan Sewerage Loan Fund, South System: —		
On account of the Charles River valley sewer	$800,046 27	
On account of the Neponset valley sewer	911,531 46	
On account of the high-level sewer and extensions: —		
For the year ending November 30, 1922	9,807 84	
For the period prior to December 1, 1921	8,188,290 21	
		9,909,675 78
Balance December 1, 1922		$107,008 97

The amount of the Metropolitan Sewerage Loan bonds issued at the end of the fiscal year was $17,411,412, bonds to the amount of $100,000 for the South System having been issued during the year. Of the total amount issued, $15,440,912 were sinking fund bonds and the remainder, amounting to $1,970,500, was serial bonds.

At the end of the year the amount of the outstanding bonds was $17,057,912, as bonds issued on the serial payment plan to the amount of $55,500 had been paid during the year, $353,500 having been paid to December 1, 1922.

Of the total amount outstanding at the end of the year, $7,282,000 were issued for the North Metropolitan System, and $9,775,912 for the South Metropolitan System. The Metropolitan Sewerage Loan Sinking Fund amounted on December 1, 1922, to $6,217,099.57, of which $3,835,862.58 was on account of the North Metropolitan System, and $2,381,236.99 was on account of the South Metropolitan System, an increase during the year of $518,871.19.

The net debt on December 1, 1922, was $10,840,812.43, a decrease of $474,371.19.

Included in the above figures for the North Metropolitan System is $925,500 in serial bonds, of which $206,500 has been paid, and $1,045,000 for the South Metropolitan System, of which $147,000 has been paid.

Maintenance.

NORTH METROPOLITAN SYSTEM.

Appropriated for the year ending November 30, 1922		$315,800 00
Receipts from pumping and other sources, which are returned to the appropriation: —		
For the year ending November 30, 1922		341 06
		$316,141 06
Amount approved for maintenance and operation of Metropolitan Sewerage Works, North System: —		
For the year ending November 30, 1922	$298,980 08	
Deduct amount paid from appropriation for the year 1921	10,910 89	
		288,069 19
Balance December 1, 1922		$28,071 87
Balance of appropriation under Item 635, chapter 203, Acts of 1921, for the construction of Reading extension pumping station		$6,155 44
Amount approved for payment to November 30, 1922		3,436 93
Balance December 1, 1922		$2,718 51

SOUTH METROPOLITAN SYSTEM.

Appropriated for the year ending November 30, 1922		$188,700 00
Receipts from sales of property, reimbursement and for pumping, which are returned to the appropriation: —		
For the year ending November 30, 1922		465 66
		$189,165 66
Amount approved for maintenance and operation of Metropolitan Sewerage Works, South System: —		
For the year ending November 30, 1922	$178,846 46	
Deduct amount paid from appropriation for the year 1921	3,223 44	
		175,623 02
Balance December 1, 1922		$13,542 64

The balance of $175,517.86 on account of construction in the North Metropolitan System consists almost entirely of the amount appropriated and remaining unexpended for lowering the sewer siphon under Malden River and the amount appropriated under chapter 529, Acts of 1922, for constructing an additional main sewer in Woburn and Winchester.

The balance of $107,008.97 remaining unexpended on account of construction in the South Metropolitan Sewerage System consists of the amount remaining for the completion of the additions to the pumping plant at Ward Street pumping station, and also amounts appropriated under chapter 529 of the Acts of 1922 for the completion of the Wellesley extension of the high-level sewer, for the construction of a new force main from the Quincy pumping station and also for a new pump and other equipment at the Quincy pumping station.

METROPOLITAN PARKS DIVISION.

Construction.

The loans authorized under the various acts of the Legislature for the construction of Metropolitan Parks and Boulevards, Charles River Bridges, Charles River Basin, North Beacon Street Bridge, Nantasket Beach, the receipts which

have been added to the loan funds, the expenditures for the acquisition of property and construction of works, and the balances available on December 1, 1922, have been as follows: —

METROPOLITAN PARKS LOAN FUND.

Metropolitan Parks Loan Fund		$9,093,043 96
Receipts added to loan before June 1, 1901		198,942 81
		$9,291,986 77
Expenditures.		
For the year ending November 30, 1922	$13,855 00	
For the period prior to December 1, 1921	9,247,944 23	
		9,261,799 23
Balance December 1, 1922		$30,187 54

The amount of the Metropolitan Parks Loan bonds issued at the end of the fiscal year was $9,809,000, no bonds having been issued during the year. Of the total amount issued, $9,485,000 were sinking fund bonds, and the remainder, amounting to $324,000, was issued as serial bonds.

At the end of the year the amount of outstanding bonds was $9,646,500, as bonds issued on the serial payment plan to the amount of $161,500 had been paid. During the fiscal year $20,250 in serial bonds has been paid.

The Metropolitan Parks Loan Sinking Fund amounted on December 1, 1922, to $4,650,143.98, an increase during the year of $247,323.85.

METROPOLITAN PARKS LOAN FUND, SERIES II.

Metropolitan Parks Loan Fund, Series II		$7,264,000 00
Receipts from sales, etc.		36,123 82
		$7,300,123 82
Expenditures.		
For the year ending November 30, 1922	$79,057 76	
For the period prior to December 1, 1921	6,662,452 67	
		6,741,510 43
Balance December 1, 1922		$558,613 39

The amount of the Metropolitan Parks Loan, Series II, bonds issued at the end of the fiscal year was $3,620,187.50, no bonds having been issued during the year. Of the total amount issued, $2,567,500 were sinking fund bonds, and the remainder, amounting to $1,052,687.50, was issued as serial bonds.

At the end of the year the amount of outstanding bonds was $3,326,793.75, as bonds issued on the serial payment plan to the amount of $293,393.75 had been paid. During the fiscal year $50,306.25 in serial bonds has been paid.

The Metropolitan Parks Loan, Series II, Sinking Fund amounted on December 1, 1922, to $1,180,444.60, an increase during the year of $64,129.35.

CHARLES RIVER BASIN LOAN.

Charles River Basin Loan		$4,500,000 00
Receipts added to loan		9,368 91
		$4,509,368 91
Expenditures.		
No expenditures for 1922.		
For the period prior to December 1, 1921		4,472,802 22
Balance December 1, 1922		$36,566 69

The amount of the Charles River Basin Loan bonds issued at the end of the fiscal year was $4,500,000, no bonds having been issued during the year. Of the total amount issued, $4,125,000 were sinking fund bonds, and the remainder, amounting to $375,000, was issued as serial bonds.

At the end of the year the amount of outstanding bonds was $4,398,000, as bonds issued on the serial payment plan to the amount of $102,000 had been paid. During the fiscal year $10,000 in serial bonds has been paid.

The Charles River Basin Loan Sinking Fund amounted on December 1, 1922, to $1,375,441.54, an increase during the year of $89,426.42.

CHARLES RIVER BRIDGES LOAN.

Charles River Bridges Loan		$1,475,000 00
Expenditures.		
For the year ending November 30, 1922	$2,118 68	
For the period prior to December 1, 1921	625 68	
		2,744 36
Balance December 1, 1922		$1,472,255 64

NORTH BEACON STREET BRIDGE LOAN.

North Beacon Street Bridge Loan		$175,000 00
Expenditures.		
No expenditures for 1922.		
For the period prior to December 1, 1921		174,853 50
Balance December 1, 1922		$146 50

NANTASKET BEACH LOAN.

Nantasket Beach Loan		$705,881 50
Expenditures.		
For the period prior to December 1, 1921		705,881 50

METROPOLITAN PARKS TRUST FUND.

Receipts for year ending November 30, 1922	$94 89	
Receipts for the period prior to December 1, 1921	40,379 89	
		$40,474 78
Expenditures.		
No expenditures for 1922.		
Expenditures for the period prior to December 1, 1922		38,106 50
		$2,368 28

Maintenance.

Metropolitan Parks Maintenance.

		Appropriation, 1922.	Expended, 1922.	Balance, December 1, 1922.
Metropolitan Parks Maintenance Fund:				
General		$710,803 25	$648,493 68	$62,309 57
Specials:				
Band concerts		20,000 00	19,531 55	468 45
Sanitary and garage	$20,000 00			
Expended to December 1, 1921	500 00			
		19,500 00	18,702 32	797 68
Cambridge Parkway		51,500 00	49,290 38	2,209 62
Cradock Bridge	$20,000 00			
Expended to December 1, 1921	8,614 06			
		11,385 94	7,511 46	3,874 48
Magazine Beach sanitary		15,000 00	7,361 50	7,638 50
Beacon Street Bridge		5,000 00	5,000 00	-
Clearing woods		100,000 00	54,916 21	45,083 79
Metropolitan Parks Maintenance Fund, boulevards:				
General		413,000 00	370,152 34	42,847 66
Specials:				
Dedham Parkway	$7,000 00			
Expended to December 1, 1921	5,534 79			
		1,465 21	-	1,465 21
Mystic Valley Parkway		40,000 00	39,922 77	77 23
Quincy shore improvements		18,000 00	17,646 94	353 06
Retaining wall, Everett	$2,500 00			
Expended to December 1, 1921	1,361 03			
		1,138 97	210 68	928 29
Road building machinery		8,000 00	4,605 93	3,394 07
Saugus River Bridge		40,418 15	40,418 15	-
West Roxbury Parkway	$75,000 00			
Expended to December 1, 1921	55,566 10			
		19,433 90	13,468 45	5,965 45
Winthrop Parkway	$225,000 00			
Expended to December 1, 1921	880 33			
		224,119 67	187,942 57	36,177 10
Charles River Basin, maintenance:				
General		179,200 00	173,145 28	6,054 72
Special, dredging certain canals	$10,000 00			
Expended to December 1, 1921	6,750 61			
		3,249 39	-	3,249 39
Nantasket Beach, maintenance		79,000 00	68,378 62	10,621 38
Wellington Bridge, maintenance		15,000 00	14,774 99	225 01
Bunker Hill, maintenance		10,000 00	8,433 40	1,566 60
Bunker Hill, special improvements		10,000 00	6,341 42	3,658 58

Metropolitan Parks Expense Fund.

Receipts:			
For the year ending November 30, 1922	$148,950 60		
For the period prior to December 1, 1921	2,114,530 00		
			$2,263,480 60
Expenditures:			
For the year ending November 30, 1922	$141,098 70		
For the period prior to December 1, 1921	1,883,912 15		
			2,025,010 85
Balance December 1, 1922			$238,469 75

General Revenue.

Bunker Hill Monument:	
Receipts, March 5, 1922, to November 30, 1922	$3,301 20

May 29, 1925 BC